News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

October 2, 1995

Ernie J. Shannon
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-6256)

RELEASE: C95-q

GODDARD AWARDS BUILDING CONTRACT TO VIRGINIA FIRM

Officials at NASA's Goddard Space Flight Center, Greenbelt, MD, have awarded a $36.5 million contract to the Manhattan Construction Co., Fairfax, VA, to build the Earth Systems Science Building at Goddard. Construction is expected to start in early October and should take approximately two years.

The building will house the majority of Goddard's Earth Science Directorate employees. Research conducted in the facility will support NASA's Mission to Planet Earth and will be dedicated to developing a greater understanding of the Earth's global environment. The building will be located on the east side of Soil Conservation Road at Goddard.

- end -

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Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Dwayne Brown
Headquarters, Washington, DC
(Phone: 202/358-1600)

For Release

October 2, 1995

VIDEO ADVISORY: V95-147

EXPERIMENTS, CREW ON NEXT SHUTTLE MISSION ON NTV TUESDAY

Tuesday's NASA Television video news file will replay a compilation of experiments that will be aboard Thursday's upcoming Space Shuttle mission, STS-73. NTV also will replay interviews of the crew for this 16-day experiment-laden flight. STS-73 will continue a cooperative effort of the U.S. government, universities and industry to further expand the frontiers of science and technology in "microgravity", the near-weightless environment of space.

Video News Files are aired each day at noon, 3, 6 and 9 p.m. EDT.

ITEM #1: STS-73 EXPERIMENTS **TRT: 26:00**
Compilation of experiments that will fly aboard STS-73

ITEM #2: INTERVIEW -- KENNETH D. BOWERSOX **TRT: 5:23**
Indiana native and mission commander discusses mission

ITEM #3: INTERVIEW -- KENT V. ROMINGER **TRT: 2:40**
Colorado native and mission pilot discusses his first upcoming flight

ITEM #4: INTERVIEW -- KATHRYN C. THORNTON, PH.D. **TRT: 1:05**
Alabama native and payload commander discusses mission

ITEM #5: INTERVIEW -- CATHERINE G. COLEMAN, PH.D. **TRT: 3:18**
South Carolina native and mission specialist discusses her upcoming first flight

ITEM #6: INTERVIEW -- MICHAEL E. LOPEZ-ALEGRIA **TRT: 1:45**
California/Spain native and mission specialist discusses his upcoming first flight

ITEM #7: INTERVIEW -- FRED LESLIE, PH.D. **TRT: 4:00**
Panama native and mission specialist discusses his upcoming first flight

ITEM #8: INTERVIEW -- ALBERT SACCO, JR., PH.D. **TRT: 5:55**
Massachusetts native and mission specialist discusses his upcoming first flight

ITEM #9: INTERVIEW -- STS-73 CREW TRAINING **TRT: 1:43**
Crew prepares for 16-day mission

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

October 3, 1995

Ed Campion
Headquarters, Washington, DC
(Phone: 202/358-1780)

Eileen Hawley
Johnson Space Center, Houston, TX
(Phone: 713/483-5111)

RELEASE: 95-166

ASTRONAUT CHARLES LACY VEACH DIES

Space Shuttle Astronaut Charles Lacy Veach, 51, died today following a lengthy illness.

Veach was selected to be an astronaut with the class of 1984 and flew as a mission specialist on two Shuttle flights -- STS-39 in April/May 1991 and on STS-52 in October 1992.

"Lacy Veach was an accomplished and beloved member of the NASA family," said NASA Administrator Daniel S. Goldin. "He was a skilled pilot and an enthusiastic explorer. We will miss him."

On STS-39, an unclassified Department of Defense mission aboard Discovery, Veach participated in various experiments, including working with an ultraviolet astronomical camera, an X-ray telescope, and a liquid-helium-cooled infrared telescope which performed observations of the Earth's atmosphere and the Aurora Australis (Southern Lights).

During STS-52, Veach and the crew deployed the Laser Geodynamics Satellite, a reflective spacecraft designed to measure movements of the Earth's crust. Veach also operated the Shuttle's robot arm to test the Space Vision System designed to improve perception of crew members while maneuvering payloads in space.

Prior to becoming an astronaut, Veach was an engineer and research pilot at the Johnson Space Center, Houston, with primary duty as an instructor pilot in the Shuttle Training Aircraft. Veach also provided Astronaut Office support to the Space Station Program.

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A 1966 graduate of the U.S. Air Force Academy, Veach earned his pilot wings at Moody Air Force Base, GA, in 1967 and spent the next 14 years as an Air Force fighter pilot, flying the F-100, F-111 and the F-105, including a 275-mission combat tour in Southeast Asia. In 1976 and 1977, he was a member of the Thunderbirds, the USAF Air Demonstration Squadron. He remained active in the Texas Air National Guard based at Ellington Field in Houston, flying F-16s.

During his service, Veach earned the Distinguished Flying Cross with Two Oak Leaf Clusters, the Air Medal with 13 Oak Leaf Clusters, the Air Force Commendation Medal with one Oak Leaf Cluster, and the Purple Heart.

Veach was born in Chicago, IL, in 1944, but considers Honolulu, HI, his hometown. He is survived by his wife and two children.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

Brian Dunbar
Headquarters, Washington, DC
(Phone: 202/358-0873)

For Release

October 3, 1995

RELEASE: 95-167

NEW RESEARCH ANNOUNCEMENT PROCESS WILL SAVE THOUSANDS OF DOLLARS

An improved process for soliciting research proposals likely will save NASA tens of thousands of dollars a year by using the Internet rather than mail distribution.

The first electronic NASA Research Announcement (NRA) was issued Sept. 22 by NASA's Office of Mission to Planet Earth (OMTPE). The announcement, soliciting several kinds of scientific proposals, was posted to the Mission to Planet Earth Home Page on the World Wide Web, and 30,000 postcards were sent to potential researchers notifying them the NRA was available.

"Using the Internet will allow OMTPE to achieve its goal of broadening its research base," said Dr. Charles Kennel, Associate Administrator for Mission to Planet Earth. "By using the Internet, we can solicit proposals from scientists who don't normally work with us, but who still have something to contribute," he said.

Normally, OMTPE and other NASA offices send NRAs by mail to lists of potential researchers, paying printing and postage costs to distribute several thousand copies.

"We sent only postcards notifying researchers that the NRA was released," said Anne Novotny, an administrative specialist, who oversees OMTPE's NRA process. "The postcards have the electronic address to download the NRA and a telephone number to call for those who don't have access to Internet, so they can request a paper copy."

"Our normal distribution is two thousand to six thousand mail copies, depending on the announcement," said Novotny. "By using the Internet, we could increase our direct notifications to thirty thousand by postcard, including six thousand overseas. If we had tried to distribute paper copies of the NRA to that many people, the cost would have been much higher."

- more -

Depending on how many people follow up with requests for paper copies of the NRA, the electronic distribution could save NASA up to $80,000, Novotny said.

Those interested can access the NRA by going to the Mission to Planet Earth Home Page (http://www.hq.nasa.gov/office/mtpe) and clicking on "MTPE Research Announcements." The FTP site is ftp.hq.nasa.gov/pub/nra, and the file names begin NRA9503.

- end -

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release

October 4, 1995

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NOTE TO EDITORS: N95-62

X-RAY TIMING EXPLORER SPACECRAFT AND SCIENCE BRIEFINGS SET FOR OCT. 6

The upcoming flight of NASA's X-Ray Timing Explorer (XTE) will be the subject of a science and spacecraft briefing scheduled for 1:30 p.m. EDT October 6. The briefing will originate from the Kennedy Space Center, FL, and will be carried live on NASA TV with two-way question and answer capability from participating NASA locations. Launch is scheduled for early November.

Scientists on the panel will be:

Dr. Alan Bunner, NASA Headquarters, Washington, DC
Dr. Rick Rothschild, University of California at San Diego
Dr. Richard Mushotzky, Goddard Space Flight Center, MD
Dr. Fred Lamb, University of Illinois

Immediately following the science panel, XTE Project Manager Dale Schulz will conduct a briefing about the spacecraft from Hangar AO at Cape Canaveral Air Station. Viewers will have the opportunity to see the actual spacecraft via NASA Television cameras during Schulz's briefing.

- end -

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Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

David Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

For Release

October 4, 1995

ATTENTION NEWS WEATHER DESK

VIDEO ADVISORY: V95-149

IMAGES OF HURRICANE OPAL ON NTV

During the NASA Television video news file at **3 p.m., 6 p.m., 9 p.m. and midnight EDT** footage from the GOES-8 weather satellite will be shown of Hurricane Opal. Infrared and visible images will be shown, taken from Monday morning through this morning. Approximate running time will be 2-1/2 minutes. The images will be replayed during tomorrow's video news file.

Video News Files are aired each day at noon, 3, 6 and 9 p.m. EDT.

-end-

News Release

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For Release

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October 4, 1995

Mary Beth Murrill
Jet Propulsion Laboratory, Pasadena, CA
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RELEASE: 95-168

NASA SCIENTISTS GO "ONLINE FROM JUPITER"

Members of NASA's Galileo project will provide a behind-the-scenes look at what it's like to be part of the flight team on a pioneering interplanetary expedition when "Online from Jupiter" makes its debut on the Internet in mid-October.

Galileo scientists and mission engineers are opening their notebooks to classrooms, museums and the public via the Internet to share their observations and experiences working on the NASA spacecraft mission to Jupiter.

From mid-October through January 1996, members of the flight team will write brief field journal entries describing the scientific puzzles, engineering challenges and excitement of discovery as the Galileo orbiter and atmospheric entry probe begin their scientific investigation of Jupiter. The atmospheric probe is set to descend into Jupiter's atmosphere on Dec. 7, the same day the Galileo orbiter begins circling the giant planet for a two-year mission.

"For the first time, we're providing a window on the inner workings and interactions of a scientific deep space mission," said Dr. Jo Pitesky, member of the Galileo Mission Planning Office. "In sharing the journal entries, we hope to give readers, particularly students, an idea of the tremendous efforts that go into controlling and collecting data from a robot spacecraft a half-billion miles away."

After reading background material and the journals, kindergarten through 12th grade students and their teachers can ask project members questions --

-more-

via E-mail -- starting in late November and running through January 1996. They will receive personal responses, corresponding with experts on subjects ranging from atmospheric science to spacecraft systems. An archive of all questions and answers will be available online. In addition, students will be able to take part in online experiments that will use actual probe data.

"Online from Jupiter" is the latest in a series of NASA educational initiatives that have taken students from studying the bottom of the Earth's oceans via the oceanographic satellite TOPEX/POSEIDON to the top of the stratosphere in NASA's Kuiper Airborne Observatory (KAO) as it flies at 41,000 feet.

The program is part of the "Sharing NASA with our Classrooms" series, organized by the NASA K-12 Internet Initiative. It is made possible by funding from the NASA Information Infrastructure Technology and Applications program, which is part of the High Performance Computing and Communications program authorized by federal legislation and passed in December 1991.

"Online From Jupiter" can be accessed electronically in several ways:

- For World Wide Web access:
http://quest.arc.nasa.gov/jupiter.html.

- For Gopher area access: quest.arc.nasa.gov; see Interactive Projects directory.

- Via E-mail: To receive regularly updated information online, join the "updates-jup" list: Send an E-mail message to:

listmanager@quest.arc.nasa.gov. In the message body, write: "subscribe updates-jup" (no quotes). This places users on an electronic mailing list to receive information.

- To receive introductory materials and other background information, send an E-mail message to: info-jup@quest.arc.nasa.gov.

-end-

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For Release
October 4, 1995

RELEASE: 95-169

EDUCATIONAL BROADCASTS LET STUDENTS FLY HIGH

This month, students all across America will have the opportunity to take a virtual journey aboard a NASA research aircraft flying over 40,000 feet above the Earth on a mission to study planets, stars and galaxies.

From the comfort of their classrooms, students can interact with astronomers and scientists who are using sophisticated infrared detectors to probe the skies in an effort to unlock the secrets of the Universe.

This unique educational project, called "Live from the Stratosphere" (LFS), is built around more than eight hours of live television coverage supported by two-way audio and computer network connections to schools, science museums, and planetariums throughout the U.S.

The Kuiper Airborne Observatory (KAO), a converted C-141 military transport based at the Ames Research Center, Mountain View, CA, will be the setting for the astronomy research missions. The Kuiper, which carries a 36-inch reflecting telescope, is the world's only airborne astronomical research facility, and has been conducting missions for more than 20 years. Scientists use the Kuiper to study heat patterns from celestial sources by operating at an altitude above 99 percent of the Earth's radiation-absorbing atmospheric water vapor. This makes the vehicle an ideal platform from which to conduct infrared astronomy observations.

LIVE FROM THE STRATOSPHERE PROGRAMS

This educational effort will involve a series of programs in October. The following are the events and scheduled times. All times are Eastern.

- On Thursday, Oct. 5, (noon-1 p.m.) there will be a one-hour "Pre-Flight Briefing" live from the main hangar at Ames. This event is designed to introduce teachers to the KAO and provide a tour of the aircraft. NASA Television will replay this event at 4 and 7 p.m.

-more-

- On Thursday, Oct. 12, the KAO will fly a 2-1/2 hour (2:30-5 p.m.) "Jupiter Mission" focused primarily on observing the gas giant. Students around the country will be gathered at a video downlink and at selected uplink sites to actually interact with the Kuiper via the Internet. This event will be replayed on NTV at 8 p.m.

- On Friday, Oct. 13, Ames will feature a "live" five-hour "Night Flight to the Stars" mission (8 p.m. - 1 a.m.) designed to observe stellar birth and death. The Kuiper will take off from Houston and land at Ames. Students at the Adler Planetarium in Chicago will have some control of the Kuiper's telescope via the Internet for a segment of the mission. Schools, planetariums and science museums across the nation will host night-long astronomical activities.

- Tuesday, Oct. 31, there will be a one-hour (2-3 p.m.) tape compilation of the most important astronomical highlights of the series.

In addition to the broadcasts, hundreds of sites around the country will downlink video and more than a dozen sites will uplink live two-way video and audio. Among the uplink sites are the National Air and Space Museum, Washington, DC; the Adler Planetarium, Chicago, IL; Fernbank Science Center, Atlanta, GA; and the Houston Museum of Natural Science.

ON-AIR DISTRIBUTION

All broadcasts, except the event on Oct. 13, will be carried on the Public Broadcasting System's (PBS), Ku-band Telstar 401 satellite, at 97 degrees West, transponder 8. For the Oct. 13 program, transponder 11 on Telstar 401 will be used. Local arrangements for PBS broadcasts will vary.

NASA Television intends to carry broadcasts live when they do not conflict with Shuttle mission programming and scheduled video news feeds. Replay times may also change due to the upcoming mission. NASA TV broadcasts on C-band, Spacenet 2, at transponder 5, 69 degrees West longitude.

Information on NASA TV and PBS scheduling can be obtained on-line at:

World Wide Web: http://quest.arc.nasa.gov/lfs/video^.html

For Gopher: quest.arc.nasa.gov; choose HOT TOPIC: Live From the Stratosphere

Alternatively, check NASA Spacelink Hot Topics directory at:

For Gopher: spacelink.msfc.nasa.gov
For World Wide Web: http://spacelink.msfc.nasa.gov
Via modem: 205/895-0028

TEACHER'S GUIDES

"Live from the Stratosphere" is a series of live and taped television broadcasts complemented by a complete educational package. This package incorporates on-line computer networks over the Internet, via Gopher and the World Wide Web, plus an array of printed materials including a 64-page Teacher's Guide, extensive archival information, and current data on the KAO, astronomy and aeronautics. Information concerning Teacher's Guides and other hardcopy materials can be obtained by calling 1-800-626-LIVE.

On-line resources can be accessed via several routes. For those with connectivity to the World Wide Web, visit the LFS homepage at:
http://quest.arc.nasa.gov/livefrom/stratosphere.html

For those with access to Gopher, go to: quest.arc.nasa.gov

To receive regular project announcements, send an e-mail message to: listmanager@quest.arc.nasa.gov and write: subscribe updates-lfs in the body of the message.

- end -

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(Phone: 202/358-1547)

October 5, 1995

Fred Brown
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-7277)

RELEASE: 95-170

IUE OPERATIONS TRANSFERRED TO EUROPE, ENDING AN ERA

After nearly two decades of continuous operations support, NASA has transferred primary control of the International Ultraviolet Explorer (IUE) to a partnership of the European Space Agency (ESA) and the Particle Physics and Astronomy Research Council (PPARC) of the United Kingdom.

As part of the U.S. space agency's continuing cost reduction efforts, day-to-day operational control of IUE was fully transferred to ESA on October 1. IUE-related science programs will be combined, and NASA will concentrate on the completion of the IUE data archive.

NASA's Goddard Space Flight Center, Greenbelt, MD, has operated the IUE in collaboration with ESA and the PPARC since the spacecraft's launch on Jan. 26, 1978. This arrangement allowed astronomers and astrophysicists in both the U.S. and Europe to make around-the-clock observations using IUE, in much the same way as telescopes at ground-based observatories are operated. The new mission design enables scientists world wide to continue to use the IUE for ongoing science programs.

The IUE is a great NASA success story and has had a tremendous impact on the astronomical community, said Dr. Andrea Dupree, the President-Elect of the American Astronomical Society. "The IUE marked the first true space observatory to be used by professional astronomers and students all over the world. The various IUE programs demonstrate superb cooperation among scientists from many different nations to address challenging problems, and the spacecraft was operated with care and ingenuity by NASA. "

-more-

A past winner of the U.S. Presidential Award for Design Excellence, IUE uses spectrographic instruments to study astronomical and cosmic phenomena visible in ultraviolet light. The observatory has observed nearly 100,000 astronomical sources, including planets, comets, stars and galaxies. The spacecraft was designed for a three-year lifetime.

According to Dr. Andrew Michalitsianos, the IUE deputy project manager at Goddard, IUE results have been used as the basis for more than 100 Ph.D. and master's degree theses in the U.S. alone.

"IUE has been and continues to be used as a central facility in most multiwavelength observations," said Michalitsianos. "Multiwavelength observation is an important modern approach in astrophysical research. In fact, the forthcoming X-Ray Timing Explorer mission is counting on the continued availability of IUE -- not to mention some observers using the Hubble Space Telescope," he said.

Some of IUE's discoveries and research results are:

- Comparative studies of aurorae on Jupiter, Saturn, and Uranus
- Discovery of molecular sulfur emission from the nucleus of a comet
- Identification of many stars with magnetic fields and surface activity
- Identification of previously unknown stellar companions to cool stars
- Measurements of stellar "winds"
- Mapping of low-density gas bubbles around the Sun and nearby stars
- Supernova observations in the Large Magellanic Cloud (a nearby galaxy)
- Measurements of the composition of planetary nebulae
- Discovery of hot (180,000 degrees Fahrenheit) gas surrounding the Milky Way
- Estimates of active galaxy sizes

Even after almost 18 years of operation, the demand for IUE observation time exceeds the time available. "More than 2,000 astronomers have used the NASA observatory at Goddard and the ESA observatory in Spain as guest observers," Michalitsianos said. "The results of these observations have been described in more than 3,000 scientific papers that appeared in major peer-reviewed astronomical journals by the end of 1994. This makes IUE the most productive and successful telescope of all time."

More information on IUE is available on the Internet at URL:

http://iuewww.gsfc.nasa.gov/iuedac/iuedac_homepage.html

-end-

News Release

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For Release

Douglas Isbell
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(Phone: 202/358-1547)

October 5, 1995
EMBARGOED FOR RELEASE AT 6 P.M. EDT

Jim Doyle
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

RELEASE: 95-171

TOUTATIS ONE OF THE STRANGEST OBJECTS IN THE SOLAR SYSTEM

Two NASA-sponsored scientists studying the Earth-crossing asteroid 4179 Toutatis with radio telescopes have found it to be one of the strangest objects in the solar system, with a highly irregular shape and an extraordinarily complex "tumbling" rotation.

Both its shape and rotation are thought to be the outcome of a history of violent collisions. A detailed description of the asteroid and its observed rotation is reported in this week's issue of the journal "Science," by Drs. Scott Hudson of Washington State University and Steven Ostro of NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA.

"The vast majority of asteroids, and all the planets, spin about a single axis, like a football thrown in a perfect spiral," Hudson said, "but Toutatis tumbles like a flubbed pass."

One consequence of this strange rotation is that Toutatis does not have a fixed north pole like the Earth. Instead, its north pole wanders along a curve on the asteroid about every 5.4 days. "The stars viewed from Toutatis wouldn't repeatedly follow circular paths, but would crisscross the sky, never following the same path twice," Hudson said.

"The motion of the Sun during a Toutatis year, which is about four Earth years, would be even more complex," he continued. "In fact, Toutatis doesn't have anything you could call a 'day.' Its rotation is the result of two different types of motion with periods of 5.4 and 7.3 Earth days, that combine in such a way that Toutatis's orientation with respect to the solar system never repeats."

-more-

The rotations of hundreds of asteroids have been studied with optical telescopes. The vast majority of them appear to be in simple rotation with a fixed pole and periods typically between one hour and one day, the scientists said, even though the violent collisions these objects are thought to have experienced would mean that every one of them, at some time in the past, should have been tumbling like Toutatis.

Internal friction has caused asteroids to change into simple rotational patterns in relatively brief amounts of time. However, Toutatis rotates so slowly that this "dampening" process would take much longer than the age of the solar system. This means that the rotation of Toutatis is a remarkable, well-preserved relic of the collision-related evolution of an asteroid.

The scientists' computer model reveals Toutatis to have dimensions of 2.9 miles by 1.5 miles by 1.2 miles. Numerous surface features, including a pair of half-mile-wide craters, side by side, and a series of three prominent ridges -- a type of asteroid mountain range -- are presumed to result from a complex history of impacts.

Hudson and Ostro used radar images obtained with the Deep Space Network Goldstone radar antenna in California and the Arecibo telescope in Puerto Rico in 1992, when Toutatis passed to within a little more than 2 million miles of the Earth. The images are reported in a companion paper, also in this week's issue of "Science."

Toutatis was discovered by French astronomers in 1989 and was named after a Celtic god that was the protector of the tribe in ancient Gaul. Its eccentric, four-year orbit extends from just inside the Earth's orbit to the main asteroid belt between Mars and Jupiter. The plane of Toutatis's orbit is closer to the plane of the Earth's orbit than any known Earth-orbit-crossing asteroid.

On September 29, 2004, Toutatis will pass by Earth at a range of four times the distance between the Earth and the Moon, the closest approach of any known asteroid or comet between now and 2060. One consequence of the asteroid's frequent close approaches to Earth is that its trajectory more than several centuries from now cannot be predicted accurately. In fact, of all the Earth-crossing asteroids, the orbit of Toutatis is thought to be one of the most chaotic.

Earth-crossing asteroids are of great interest to scientists for their relationships to meteorites, main-belt asteroids and comets; as targets of human or robotic exploration; as sources of materials with potential commercial value; and as long-term collision hazards. Nearly 300 Earth-crossing asteroids have been discovered, but the entire population is thought to include some 1,500 objects larger than one kilometer and some 135,000 objects that are larger than 100 meters.

-more-

The scientists' work was funded by the Planetary Geology and Geophysics Program and the Planetary Astronomy Program of NASA's Office of Space Science, Washington, DC.

-end-

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For Release
October 5, 1995

Ray Villard
Space Telescope Science Institute, Baltimore, MD
(Phone: 410/338-4514)

RELEASE: 95-172

**SATURN MOON MYSTERY CONTINUES:
COULD HUBBLE HAVE DISCOVERED SHATTERED SATELLITES?**

NASA's Hubble Space Telescope has discovered several orbiting clumps of icy rubble that could be the remnants of recently shattered moonlets orbiting near the outer edge of Saturn's ring system.

Astronomers say this could represent the discovery of a new class of ephemeral, transitional object in the solar system which provides new clues to the origin and evolution of Saturn's spectacular rings.

This startling conclusion is based upon Hubble's observation of Saturn made as Earth crossed the plane of the ring system on August 10, which provided a rare opportunity to seek out faint satellites in and near the ring plane.

"Ring plane crossing" refers to the brief interval when the Earth crosses the plane of Saturn's rings, allowing them to be seen edge on. At such times, the usually bright rings are seen only as a faint, thin line, and Saturn's smaller satellites become visible. These events are rare, occurring in groups of two or four at intervals of about 14.5 years. The previous series of crossings occurred in 1980.

The latest Hubble pictures gave astronomers an opportunity to confirm the presence of two new satellites first discovered by the Space Telescope in images taken during the May 22 ring plane crossing. Rather than solving the moon question, however, the August observations presented astronomers with a new mystery.

"We realized these moons are too bright to have gone undetected when the Voyager spacecraft flew by Saturn in 1980 and 1981," said Philip Nicholson of Cornell University, Ithaca, NY.

-more-

A further complication is that the August pictures seem to show at least three new objects, and in different orbits from the two May objects.

"They also appear to be very elongated or arc-like, unlike a satellite should be," Nicholson said. "One possibility is that they are large clouds of debris from small satellites shattered by impacts with chunks of space debris, possibly comets, sometime during the 14 years since the Voyager 2 flyby."

Just as a small handful of chalk dust can make a large dust cloud if tossed in the air, a shattered moonlet would be much brighter and more visible than when all of its mass is compressed into a single solid body.

The discovery of objects in this transitional phase is not totally unexpected, Nicholson said, because one scenario for the origin of Saturn's ring system is that it is made up of countless fragments from several pulverized moons. This idea is reinforced by the fact the new objects orbit Saturn near the narrow F ring, which is a dynamic transition zone between the main rings and the larger satellites. Moonlets in this region can easily be disrupted by Saturn's tidal pull if they are fractured by an impact, forming a cloud of debris. Eventually such a cloud would spread around the moon's orbit to form a new ring.

The dynamics of this zone also are evident in Hubble's observations of the satellite Prometheus. Although a third object seen in the May images was first suspected to be another new satellite because its location did not match the predicted position for any of the known satellites charted by Voyager, it now appears that this body is in fact Prometheus, which has slipped in its orbit by 20 degrees from the predicted position. Nicholson suggests that this may be a consequence of a "collision" of Prometheus with the F ring, which is believed to have occurred in early 1993. The moon may have passed close enough to one of the denser, lumpy regions of the F ring to have its orbit changed.

The researchers plan to obtain further observations of Saturn's moons and rings during the third ring plane crossing, which occurs on November 21.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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Kyle Herring
Johnson Space Center, Houston
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For Release
October 6, 1995

RELEASE: 95-173

COMMANDER, PILOT ROUND OUT STS-78 CREW

U.S. Air Force Colonel Terence T. "Tom" Henricks and Kevin R. Kregel have been named commander and pilot, respectively, for a 16-day life and microgravity science mission aboard the Space Shuttle Columbia scheduled for launch in June 1996.

Henricks and Kregel join five others named in May for the mission designated STS-78. Mission Specialists will be Susan J. Helms (Lt. Col., USAF), Dr. Richard M. Linnehan, and Dr. Charles E. Brady, Jr. (Commander, USN). Payload Specialists will be Dr. Jean-Jacques Favier, of the French Atomic Energy Commission (CEA) and astronaut of the French Space Agency (CNES), and Dr. Robert Brent Thirsk, of the Canadian Space Agency. Pedro Duque of the European Space Agency and Dr. Luca Urbani of the Italian Space Agency are alternates to Favier and Thirsk.

Henricks, 43, flew on the STS-44 mission of Atlantis in November 1991 and STS-55 on Columbia in April 1993 before he commanded this year's STS-70 flight. He earned a master's degree in public administration from Golden Gate University in 1982 after graduating from the Air Force Academy in 1974 with a bachelor of science degree in civil engineering. He considers Woodville, OH, his hometown.

Kregel, 39, will be making his second Shuttle flight following the STS-70 mission where he was pilot. He received a bachelor of science degree in astronautical engineering from the Air Force Academy in 1978 and a master's degree in public administration from Troy State University in 1988. He considers Amityville, NY, his hometown.

STS-78's experiments will build on previous Space Shuttle Spacelab flights dedicated to life sciences and microgravity investigations.

- end -

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release
October 10, 1995

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NOTE TO EDITORS: N95-63

BRIEFINGS SET FOR SECOND SHUTTLE-MIR DOCKING MISSION

NASA's second mission to dock the Space Shuttle Atlantis to the Russian space station Mir will be discussed in a series of briefings to be held October 17 and 20 at the Johnson Space Center (JSC), Houston, TX and the Goddard Space Flight Center (GSFC), Greenbelt, MD.

STS-74 is scheduled to be launched in early November on an eight-day mission to attach a Russian-built docking module to the Mir's Kristall Science Module, forming a permanent docking port on the Mir for future Shuttle visits. Atlantis will spend three days linked to the Mir. The Shuttle's five crew members will conduct joint scientific studies and transfer logistical supplies with the three cosmonauts aboard Mir, who have been aboard the station since Sept. 3, 1995. The Mir 20 crew includes Commander Yuri Gidzenko, Flight Engineer Sergei Avdeyev and European Space Agency Cosmonaut-Researcher Thomas Reiter from Germany.

The briefings will begin at the JSC on October 17 at 10 a.m. EDT with an overview of the Phase One Program, which manages the series of joint missions involving the Shuttle and the Mir space station. That briefing will be followed by a Mission Overview briefing at 11 a.m. EDT. A briefing on the Docking Module will begin at 12:05 p.m. EDT. The briefings will conclude for the day at 1:30 p.m. EDT with an overview of the STS-74 Getaway Special experiments from Goddard.

Status reports on the progress of the ongoing STS-73/USML-2 mission will be provided prior to the mission overview and docking module briefings.

On October 20, Atlantis' five astronauts will conduct their preflight crew news conference at JSC at 3:05 p.m. EDT.

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After the crew news conference, reporters will have a chance to conduct local only, one-on-one round-robin interviews with the STS-74 astronauts at JSC. Interested media representatives should contact Kyle Herring or Eileen Hawley at the JSC Public Affairs office at 713/483-5111 by close of business on October 18.

All of the briefings will be carried live on NASA Television with two-way question and answer capability from participating NASA locations.

Following is the briefing schedule (all times are EDT):

October 17, 1995

10 a.m.	Phase One Overview (originating from JSC) Frank Culbertson, Acting Phase One Program Director
11 a.m.	Mission Overview (originating from JSC) Bill Reeves, STS-74 Lead Flight Director
12:05 p.m.	Docking Module Overview (originating from JSC) Dave Hamilton, Docking System Project Manager Don Noah, Docking Module Project Manager John McManamen, Docking Mechanism Chief Engineer
1:30 p.m.	STS-74 Getaway Special Briefing (originating from GSFC) Gerry Daelemans, GPP Mission Manager Dr. Lyle Broadfoot, GLO-4 Principal Investigator Dr. Mike Gilbert, PASDE Co-Principal Investigator

October 20, 1995

3:05 p.m.	STS-74 Crew News Conference (originating from JSC) Ken Cameron, Commander Jim Halsell, Pilot Chris Hadfield, Mission Specialist 1 Jerry Ross, Mission Specialist 2 Bill McArthur, Mission Specialist 3

NASA Television is loacted Spacenet 2, Transponder 5, Channel 9 at 69 degrees West longitude. The transponder frequency is 3880 Mhz and the audio subcarrier is 6.8 Mhz. Polarization is horizontal.

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News Release

National Aeronautics and
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Washington, DC 20546
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Jim Cast
Headquarters, Washington, DC
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For Release
October 10, 1995

RELEASE: 95-174

NASA SELECTS PHASE II SMALL BUSINESS PROJECTS

NASA announced today the selection of 155 research proposals for negotiation of Phase II contract awards in NASA's Small Business Innovation Research Program (SBIR). The selected projects, which have a total value of approximately $92 million, will be conducted by 127 small, high-technology firms located in 23 states.

A total of 369 proposals were submitted by SBIR contractors completing Phase I projects that were initiated in 1994.

SBIR goals are to stimulate technological innovation, increase the use of small business (including minority and disadvantaged firms) in meeting federal research and development needs, and increase private sector commercialization of results of federally-funded research.

Phase I project objectives are to determine feasibility of research innovations meeting agency needs. Phase II continues development of the most promising Phase I projects. Selection criteria include technical merit and innovation, Phase I results, value to NASA, commercial potential, and company capabilities. Funding for Phase II contracts may be up to $600,000 for a two-year performance period.

The SBIR program is managed by NASA's Office of Space Access and Technology, NASA Headquarters, Washington, DC, and all individual SBIR projects are managed by the NASA field centers and the Jet Propulsion Laboratory.

NASA, under the Fiscal Year 1996 continuing resolution appropriations, does not currently have funds available for the award of Phase II selections announced on October 10, 1995, emanating from Program Solicitation SBIR 94-1. However, NASA will proceed with negotiations with selected Phase II firms, but the award will be withheld pending availability of funds whenever provided in the future. It is estimated that funds could be available by mid-November 1995, although there is a remote possibility that funds may not be available at that time.

-more-

EDITOR'S NOTE: A printed listing of companies selected for this program is available in the NASA Headquarters Newsroom (Phone: 202/358-1600) and can also be accessed electronically at 800/547-1811 or on the Internet at:

ftp://coney.gsfc.nasa.gov/pub/SBIR/awards/text/94ph2.txt

SBIR PHASE II AWARD DISTRIBUTION BY NASA FIELD CENTER

NASA INSTALLATION	AWARDS	FIRMS
Ames Research Center Moffett Field, CA	16	16
Dryden Flight Research Center Edwards, CA	5	5
Goddard Space Flight Center Greenbelt, MD	21	21
Jet Propulsion Laboratory Pasadena, CA	20	18
Johnson Space Center Houston, TX	18	16
Kennedy Space Center Kennedy Space Center, FL	6	6
Langley Research Center Hampton, VA	20	19
Lewis Research Center Cleveland, OH	21	21
Marshall Space Flight Center Marshall Space Flight Center, AL	21	21
NASA Headquarters Washington, DC	3	3
Stennis Space Center Stennis Space Center, MS	4	4

-end-

News Release

National Aeronautics and
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For Release
October 10, 1995

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RELEASE: 95-175

NASA FLIGHT TESTING BEGINS FOR F-18 NOSE STRAKES

NASA is flight testing a new aircraft control device that promises to give fighter pilots of the future increased maneuverability and agility in air combat situations.

Two moveable "flipper-like" panels called strakes have been installed on the nose of an F-18 aircraft at NASA's Dryden Flight Research Center, Edwards, CA. When opened, the strakes (four feet long, six inches wide, and hinged along the bottom edge) interact with strong vortices of air generated by the nose of the aircraft. This interaction produces side forces which can give a pilot yaw (left or right) control of the aircraft's nose at high angles of attack when conventional rudders lose their effectiveness.

"Angle of attack" is a term used to describe the angle of an aircraft's body and wings in relation to its actual flight path. During maneuvers, pilots often fly at extreme angles of attack, with the nose pitched up while the aircraft continues in its original direction. This can lead to conditions in which the flow of air over the rudder is not enough for the pilot to maintain yaw control.

The strake project, called Actuated Nose Strakes for Enhanced Rolling (ANSER) is managed by the NASA Langley Research Center, Hampton, VA. The current flight project is validating extensive wind tunnel and simulation data generated by Langley and NASA's Ames Research Center, Moffett Field, CA.

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The strake testing is being carried out with the modified F-18 NASA has been using for high angle of attack studies at Dryden since the late 1980s.

About 65 flights to study the strakes at various angles of attack and speeds are planned before the ANSER project is scheduled to conclude at the end of this year.

- end -

News Release

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For Release

October 10, 1995

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RELEASE: 95-176

SUPERSONIC AIRCRAFT EXHAUST MEASUREMENTS TO HELP FUTURE OZONE, AIRCRAFT STUDIES

Environmental scientists and aircraft engineers should benefit from the first direct measurements of an airliner's exhaust at supersonic speed, the results of which are being published this week.

In October 1994, NASA ER-2 aircraft flew through the trail of an Air France Concorde that was in flight at twice the speed of sound near New Zealand. Instruments aboard the aircraft measured carbon dioxide, water vapor, particles and nitrogen compounds in the exhaust.

Certain nitrogen compounds are a major concern because of their known role in depleting the ozone layer, said David Fahey of NOAA's Aeronomy Laboratory, Boulder, CO, lead author of a paper on the experiment in the Oct. 6 issue of *Science*. The amounts of these chemicals in the plume were consistent with previous lab tests of the Concorde engines, suggesting that pre-flight engine tests are likely to give good estimates of the actual in-flight emissions of new supersonic aircraft.

However, the level of aerosols—very fine droplets or solid particles—in the plume was higher than expected, a result that will also affect the predictions of the impact on the ozone layer. "The result that became evident in this study is that particles could alter the impact of nitrogen oxides on ozone," Fahey said.

-more-

Particles form when sulfur in the aircraft fuel is converted, either in the atmosphere or during combustion in the engine, to other forms. They contain a complex mixture of many substances, including sulfur.

From their particle measurements, the authors of the *Science* study calculate that a future possible fleet of 500 supersonic passenger aircraft could increase the surface area of particles in the atmosphere by an amount similar to that following small volcanic eruptions. In the mid-latitudes, such particle emissions may increase ozone loss more than would be expected from nitrogen oxide emissions alone.

The increase in the number of particles may also affect the ozone-related processes occurring on wintertime polar stratospheric clouds (PSCs) in the polar regions. Scientific studies have shown that the Antarctic ozone hole occurs when the ozone depletion caused by human-made chlorine and bromine compounds is enhanced by the presence of PSCs.

Scientists from the National Oceanic and Atmospheric Administration (NOAA), NASA, the French Office National d'Etudes et Recherches Aerospatiales (ONERA), and many universities took part in the experiment. The flight through the Concorde trail took place during an international study of ozone-depletion processes that was conducted throughout 1994 from New Zealand.

The ER-2, loaded with scientific instruments, flew S-patterns along the Concorde flight track, encountering the exhaust plume several times. Because carbon dioxide is the principal product of the jet fuel combustion, the scientists were able to compare the measured amounts of the emitted gases and particles directly with the amount of fuel burned by the Concorde engine. This allows scientists to use the known fuel loads of supersonic aircraft to estimate total emissions of gases and particles to the atmosphere.

Further study will be needed to determine the ultimate effects on stratospheric ozone and to evaluate the effectiveness of possible options for controlling the sulfur content of aircraft fuel. But the first-of-a-kind, direct measurements reported in *Science* will substantially improve the reliability of those studies.

"We didn't know if we could do this before. Now we do," said NASA's Michael J. Kurylo, who managed the space agency's portion of the ozone research. "We know that this unique suite of instruments, which were developed for atmospheric ozone research, can step up to these critical measurements."

"These results will be especially useful for NASA's High-Speed Research Program," said Howard Wesoky, who manages NASA's program to study the atmospheric effects of aircraft. "HSRP is designed to develop advanced techologies for a future American supersonic transport. The program includes not only efforts to measure the environnmental effects of supersonic aircraft, but also partnerships with industry to develop cleaner-burning engines."

The Concorde study is an example of the effectiveness of international cooperation in the analysis of the atmospheric effects of aviation. Program managers and scientists at NOAA, NASA, ONERA, and universities, seized upon a unique opportunity posed by the timing of the Concorde charter flight and NASA's ER-2 research plane. The Concorde and ER-2 pilots worked closely together to arrange details of the combined aircraft operation.

-end -

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News Release

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For Release

Jim Cast
Headquarters, Washington, DC
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October 11, 1995

RELEASE: 95-177

GOLDIN TO KICK OFF "TECH 2005" CONFERENCE IN CHICAGO

The world's largest technology transfer conference and exposition -- "Technology 2005" -- will be held October 24-26 at Chicago's McCormick Place Convention Center.

On October 24, keynote speaker Daniel S. Goldin, NASA Administrator, will be joined by government and industry leaders to formally open the three-day event. Over 60,000 square-feet of exhibits will be featured, showcasing new and next-generation technologies offered for license, joint development or sale by NASA, other federal laboratories, universities and high-tech companies. Thousands of engineers, managers, scientists and entrepreneurs from across the nation will attend to find new product/business items, engineering solutions and partnership opportunities to bolster their competitiveness.

In the NASA exhibits area, over 50 different technology opportunities will be displayed by numerous areas of industry including energy, the environment, information systems, communications, health care, transportation and new materials and technologies. For example, a unique partnership among NASA, Sprint, VTEL and the University of Texas Health Science Center will showcase advances in telemedicine for Texas physicians in caring for tuberculosis patients and children with cancer.

This sixth annual event is sponsored by NASA, "NASA Tech Briefs" magazine, and the Technology Utilization Foundation in cooperation with the Federal Laboratory Consortium for Technology Transfer.

- end -

NOTE TO EDITORS: For further information on Technology 2005, including press accreditation and logistics details, please contact Judy Rovins, c/o the Technology Utilization Foundation: 203/454-7203, or 1-800/237-7203 (or through Compuserve: 70363,525.) Also please visit the Technology 2005 Home Page at: http://www.keds.com/tech2005.

News Release

National Aeronautics and
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Washington, DC 20546
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For Release

October 11, 1995

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RELEASE: 95-178

HUBBLE SEES MATERIAL EJECTED FROM COMET HALE-BOPP

New pictures from NASA's Hubble Space Telescope of the recently discovered comet Hale-Bopp show a remarkable spiral "pinwheel" pattern and a "blob" of free-flying debris near the comet's nucleus.

Although this comet is still well outside the orbit of Jupiter (almost 600 million miles from Earth) it looks surprisingly bright, fueling predictions that it could become the brightest comet of the century in early 1997. The Hubble observations will help scientists determine if Hale-Bopp is really a giant comet or rather a more moderate-sized object whose current activity is driven by outgassing from very volatile ice which will "burn out" over the next year.

The bright clump of light along the spiral may be a piece of the comet's icy crust that was ejected into space by a combination of ice evaporation and the comet's rotation, which then disintegrated into a visible cloud of particles.

Although the ejected "blob" is about 3.5 times fainter than the brightest portion of the nucleus, the clump appears brighter because it covers a larger area. The debris follows a spiral pattern because the solid nucleus is rotating like a lawn sprinkler, completing a single rotation about once per week.

Ground-based observations conducted over the past two months have documented at least two separate episodes of jet and pinwheel formation and

-more-

fading. By coincidence, the first Hubble images of Hale-Bopp, taken Sept. 26, immediately followed one of these outbursts and allow researchers to examine it at unprecedented detail. For the first time, they saw a clear separation between the nucleus and some of the debris being shed.

By putting together information from the Hubble images and those taken during the recent outburst using a telescope at the Teide Observatory (Tenerife, Canary Islands, Spain), astronomers found that the debris is moving away from the nucleus at a speed of about 68 miles per hour.

Even more detailed Hubble images will be taken with the Planetary Camera in late October to follow the further evolution of the spiral, look for more outbursts, place limits on the size of the nucleus, and use spectroscopy to study the enigmatic comet's chemical composition.

Comet Hale-Bopp was discovered on July 23, 1995, by amateur astronomers Alan Hale and Thomas Bopp. The Space Telescope Science Institute is operated by the Association of Universities for Research in Astronomy, Inc. (AURA) for NASA, under contract with the Goddard Space Flight Center, Greenbelt, MD. The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency (ESA).

- end -

EDITOR'S NOTE: An image of Hale-Bopp is available to media representatives by calling the Headquarters Imaging branch at 202/358-1900. NASA photo number is: color: 95-HC-607 B&W: 95-H-618

Image files in GIF and JPEG format may be accessed on the Internet via anonymous ftp from ftp.stsci.edu in /pubinfo. The same images are available via World Wide Web from URL http://www.stsci.edu/pubinfo/Latest.html, or via links in http://www.stsci.edu/pubinfo/Pictures.html

		GIF	JPEG
PRC95-41	Comet Hale-Bopp	gif/HaleBopp.gif	jpeg/HaleBopp.jpg

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For Release

October 11, 1995

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RELEASE: 95-179

NASA PIONEER WALTER C. WILLIAMS DIES

Walter C. Williams, a NASA pioneer whose career stretched across more than a half century at the leading edge of developments in air and space, died Oct. 7 at age 76.

Williams was the first director of what later became the Dryden Flight Research Center, Edwards, CA, and later served as NASA's Chief Engineer at Headquarters in Washington, DC. A memorial service is planned for early November.

"Walt Williams was an American aerospace pioneer of the highest order," said NASA Administrator Daniel S. Goldin. "He began serving his country during the era of piston-driven aircraft, and for the next 50 years he was at the center of events as the U.S. moved into the Jet Age and then into the Space Age. Our country owes him and his generation a debt of gratitude for all that they accomplished."

Williams began his government aerospace career with the National Advisory Committee for Aeronautics -- NASA's predecessor agency -- in August 1940. During World War II, he was project engineer in highly successful efforts to improve the handling qualities, maneuverability, and high-speed characteristics of fighters such as the P-47, P-51, and F6F.

In 1946, Williams became project engineer for the rocket-powered X-1 research aircraft. In September 1946, he headed a team of five engineers who arrived at Muroc Army Air Base (now Edwards AFB) from NACA's Langley Memorial Aeronautical Laboratory, Hampton, VA, (now the Langley Research Center) to prepare for X-1 supersonic research flights in a joint NACA-Army Air Corps program. This established the first NACA-NASA presence at the Mojave Desert site where Capt. Charles E. Yeager carried out the first piloted supersonic flight on October 14, 1947.

-more-

Williams then became the founding director of the NACA High Speed Flight Station that in 1976 became the Dryden Center. In this assignment, he directed a great variety of flight research programs, including the D-558-2, which achieved the first flight at twice the speed of sound, and the beginnings of the X-15 project, which set world altitude and speed records, was the world's first hypersonic aircraft, and was the most successful research aircraft to date. During those years, Dryden became the premier flight research installation in the United States.

In September 1959, Williams returned to Langley to become Associate Director of the newly formed Space Task Group, which was created to carry out Project Mercury. Williams served as Director of Operations for the Project and supervised all of the Mercury missions.

He next became Associate Director of NASA's Manned Spacecraft Center, Houston, TX (now the Lyndon B. Johnson Space Center). In this position, Williams was responsible for Mercury factory check-out, pre-launch preparations, launch and inflight activities, recovery operations and post-flight analysis as well as future flight planning.

Williams left Houston in January 1963 to become Deputy Associate Administrator in the Office of Manned Space Flight at NASA Headquarters. He left NASA in April 1964 to become Vice President and General Manager of the Vehicle Systems Division, Aerospace Corp., where he was responsible for systems engineering and technical direction of the Gemini launch and target vehicles, Titan III space launch vehicles, Manned Orbiting Laboratory, and Aerospace's activities at both the Eastern and Western Test Ranges.

He left Aerospace Corp. in 1975 to return to NASA Headquarters as Chief Engineer. He retired from that position in July 1982 and became an aerospace consultant residing in Tarzana, CA. He periodically served on NASA task forces in his later years.

During his career, he twice received the NASA Distinguished Service Medal and was nominated both to the Meritorious Rank and Distinguished Rank in the Federal Senior Executive Service. His other honors and awards include the 1981 Federal Engineer of the Year Award by the National Society of Professional Engineers, and the American Astronautical Society Space Flight Award in 1978. He also received several awards from the American Institute of Aeronautics and Astronautics -- in 1964, the Haley Astronautics Award for his contributions to the advancement of space flight and in 1962, the Sylvanus Albert Reed Award for his contributions to supersonic and space flight.

He was born in New Orleans on July 30, 1919, and graduated with a bachelor's degree in aeronautical engineering from Louisiana State University, Baton Rouge, in 1939. In 1963 he was awarded an honorary doctorate of engineering degree by LSU.

He is survived by his wife, Helen M. Williams; his sons Charles M. Williams of Houston, TX, and Howard L. Williams of Phoenix, AZ; and his daughter Elizabeth Ann Powell of Redmond, WA.

-end-

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For Release

Dwayne Brown
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October 11, 1995

RELEASE: 95-180

NASA/AIR FORCE SIGN COST-SAVING SUPPORT SERVICES AGREEMENT

NASA and the U.S. Air Force today signed a nine-year agreement which provides for communications support to be furnished by NASA for the Air Force's Titan IV/Centaur launch program. This arrangement will save the U.S. government millions of dollars.

The agreement calls for NASA's Tracking and Data Relay Satellite System (TDRSS) to provide tracking and data acquisition services in support of the Air Force's MILSTAR satellite launch scheduled for mid-November from the Cape Canaveral Air Force Station, FL, and other Air Force launches occurring over the agreement period. After final checkout on the MILSTAR mission, the Air Force intends to make TDRSS the primary tracking and data acquisition system for those portions of the Titan IV/Centaur launches not covered by ground sites.

"TDRSS support of future Titan launches will mark the first time that our system has supported an expendable launch vehicle operationally. This not only demonstrates the cost-effectiveness of TDRSS, but also the versatility of NASA's unique communications system," said Charles T. Force, NASA's Associate Administrator for Space Communications.

The TDRSS coverage will reduce, and in most cases replace, support provided by the Air Force's Advanced Range Instrumentation Aircraft for major phases of Titan IV/Centaur launches -- where up to five aircraft may be used for a launch. Due to the high cost of personnel and logistical needs of these aircraft, the Air Force looked at other alternatives and determined that TDRSS was the logical solution in this budget-tight era. For some launches, however, at least one aircraft may still be needed to provide coverage for certain critical launch phases.

"We plan to launch 11 more Titan IV/Centaurs from 1996 through 2004. By using the TDRSS to support these launches, we expect to save an estimated $14 million over the term of the agreement. We are the first non-NASA agency to take advantage of TDRSS, and this marks a critical milestone in our efforts to upgrade our range capabilities," said Air Force Brigadier General Robert C. Hinson, Commander of the 45th Space Wing.

-more-

NASA and the Air Force conducted extensive tests from March 1994 through June 1995 to ensure that the TDRSS is compatible with the Titan IV/Centaur rocket and its related ground support facilities.

TDRSS is a space-based network that provides communications, tracking, telemetry, data acquisition, and command services essential to Space Shuttle and low-Earth orbital spacecraft missions. The TDRSS consists of two major elements -- a constellation of geosynchronous satellites and a ground terminal located at White Sands, NM. NASA's Goddard Space Flight Center, Greenbelt, MD, manages the daily operation of the system. The Office of Space Communications, Washington, DC, has overall system management responsibility.

-end-

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News Release

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For Release
October 11, 1995

RELEASE: 95-181

STUDENTS PREPARE NEW KIDSAT PAYLOAD TO FLY ON SPACE SHUTTLE

NASA has begun a new, three-year pilot education program designed to bring the frontiers of space exploration into classrooms via the Internet.

Known as KidSat, the program will allow students to operate instruments and download images in real-time from the Space Shuttle and in the future, from the international Space Station.

KidSat is an innovative curriculum, coupled with instruments, mission operations and information systems, currently in development by NASA and the educational community to explore Earth from space. With these new learning tools, students will be able to view the Earth as the astronauts do and gain valuable new perspectives on the scale and fragility of the planet they will inherit.

"KidSat will be designed, built and operated by students," said KidSat principal investigator Dr. JoBea Way of NASA's Jet Propulsion Laboratory (JPL) Pasadena, CA. "The underlying philosophy of this program is to stimulate young people's interests in learning by giving them their own piece of the space program."

Three middle schools are participating in the initial phase of the KidSat pilot program, including Samuel Gompers Secondary School in San Diego, CA, Buist Academy in Charleston, SC, and the Washington Accelerated Learning Center in Pasadena, CA. JPL and the University of California, San Diego (UCSD) have formed a partnership to support the student project. JPL is preparing the flight and data system for the program. UCSD will run the mission control gateway, linking to student mission operations centers at each participating school. Over the next two years, additional classrooms will be connected to the UCSD mission control gateway from the Omaha, Houston and Baltimore school districts.

As the KidSat payload begins to fly on selected Shuttle missions, other aspects of the program will be finalized and put in place. By the end of the pilot program, the KidSat interactive Internet site will be fully on-line, a new curriculum to accompany KidSat data will be available and, if the pilot program is successful, the KidSat payload will be ready for early flights on the international Space Station.

-more-

"KidSat represents an investment in the nation's future, giving students exposure to environmental studies from low-Earth orbit," said former astronaut Dr. Sally Ride, a professor of physics at UCSD. Ride is leading the development of the mission operations element of KidSat with NASA's Johnson Space Center, Houston, TX, and a team of undergraduate and graduate students.

"By attaching KidSat to the Space Shuttle, students will be able to participate in space exploration as astronauts and cosmonauts do," Ride said.

"The program will provide an innovative way to present materials to students and will underscore the opportunities they have to comprehend and master concepts that are being presented," added Elizabeth Jones Stork, director of the western regional branch of the Johns Hopkins University Institute for the Academic Advancement of Youth. Johns Hopkins is developing the educational curriculum component of the program. "In turn, those experiences will challenge young explorers and encourage them to apply their skills to real world issues."

The first instrument payloads to fly aboard the Space Shuttle will consist of an electronic still camera mounted in the overhead window of the Orbiter and two video cameras mounted in the cargo bay. Students will be able to operate the cameras from their classroom and photograph regions of the world that interest them.

If they are studying the principles of gravity or geometry, for example, they would be able to use KidSat data to visualize the concepts. Or they could use data to study current events -- such as the flooding of the Mississippi River, volcanic eruptions, or the advance of deforestation in the Amazon -- and understand the impact of natural and human activities on the environment. History, in turn, could be recreated by imaging regions of the U.S. where famous battles of the Civil War were fought.

After the pilot program is completed, the KidSat cameras may be replaced by more elaborate instruments, providing both telepresence capabilities and better remote-sensing tools. Technologies to create a full telepresence in space will be possible using JPL's digital image animation laboratory and new optical technologies.

The KidSat pilot program is sponsored by NASA's Office of Human Resources and Education, with support from the Offices of Space Flight, Mission to Planet Earth, and Space Science, Washington, DC.

-end-

EDITOR'S NOTE: Images of KidSat are available to media representatives by calling the Headquarters Imaging branch on 202/358-1900. NASA photo numbers are: color: 95-HC-492 and 606 B&W: 95-H-541 and 617

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

October 12, 1995

Keith Koehler
Wallops Flight Facility, Wallops Island, VA
(Phone: 804/824-1579

NOTE TO EDITORS: N95-64

METEOR MISSION LAUNCH SET FOR OCTOBER 20

EER Systems, Inc., has announced the launch date for the METEOR mission, a commercial orbital and reentry rocket flight on which there are several NASA-sponsored payloads, for October 20. The launch window for the METEOR mission opens at 4 p.m. EDT and closes at 7 p.m. EDT. Optimum launch time is 6 p.m. EDT.

On October 20 EER Systems will hold a prelaunch status briefing at 11 a.m. EDT at the Wallops Flight Facility Visitors Center. From 11:30 a.m. to 1 p.m. EDT, NASA-sponsored payload principal investigators, as well as other EER Systems commercial payload customers, will be available to the media for interviews at the METEOR media center, located in the Teacher Resource Center on the grounds of the Wallops Visitor Center.

EER Systems will hold a post-launch briefing in the Visitors Center auditorium approximately 90 minutes after launch.

Media wishing to attend the launch of the METEOR mission must send a written request for accreditation to Wallops Public Affairs (fax: 804/824-1971) by no later than Tuesday, October 17. Previously accredited media representatives need not renew their credentials.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

Don Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

October 12, 1995

Jim Sahli
Goddard Space Flight Center, Greenbelt, MD
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Ray Villard
Space Telescope Science Institute, Baltimore, MD
(Phone: 410/338-4514)

NOTE TO EDITORS: N95-65

NEW HUBBLE FINDINGS AND IMAGES PRESENTED AT MEETING

A discovery of ozone on Jupiter's satellite Ganymede, a possible new active volcano on Jupiter's moon Io and an aurora on Saturn are among the new findings and images presented by NASA's Hubble Space Telescope scientists this week at the American Astronomical Society's 27th Annual Meeting of the Division of Planetary Sciences in Kona, Hawaii.

The following is a summary of the Hubble findings and images. Images illustrating the findings are available (where noted) to news media representatives by calling the Headquarters Imaging Branch at 202/358-1900. The images also are available on the Internet as noted.

"JUPITER FAMILY PHOTO"

Hubble has produced a "family portrait" of the four largest moons of Jupiter, first observed by the Italian scientist Galileo Galilei nearly four centuries ago. Located approximately one-half billion miles away, the moons are so small that, in visible light, they appear as fuzzy disks in the largest ground-based telescopes. Hubble can resolve surface details seen previously only by the Voyager spacecraft in the late 1970s and early 1980s. Over the past year Hubble has charted new volcanic activity on Io's active surface, found a faint oxygen atmosphere on the moon Europa, and identified ozone on the surface of Ganymede.

-more-

Hubble ultraviolet observations of Callisto show the presence of fresh ice on the surface that may indicate impacts from micrometeorites and charged particles from Jupiter's magnetosphere. Hubble observations will play a complementary role when the Galileo spacecraft arrives at Jupiter in December of this year.

PHOTO NUMBER: color: 95-HC-610 B&W: 95-H-621

Image files in GIF and JPEG format may be accessed on Internet via anonymous ftp from ftp.stsci.edu in /pubinfo.

The same images are available via World Wide Web from URL
http://www.stsci.edu/pubinfo/Latest.html
http://www.stsci.edu/pubinfo/Pictures.html

	GIF	JPEG
Galilean Satellites	gif/GalSat.gif	jpeg/GalSat.jpg

NEW FEATURE ON IO

A pair of images of Jupiter's volcanic moon Io shows the surprising emergence of a 200-mile diameter, large yellowish-white feature near the center of the moon's disk. This is a more dramatic change in 16 months than any seen over the previous 15 years, researchers said. They suggest the spot may be a new class of transient feature on the moon. A comparison photo taken in March 1994 -- before the spot emerged -- shows that Io's surface underwent only subtle changes since it was last seen "close-up" by the Voyager 2 probe in 1979.

PHOTO NUMBER: color: 95-HC-609 B&W: 95-H-620

Image files in GIF and JPEG format may be accessed on Internet via anonymous ftp from ftp.stsci.edu in /pubinfo.
The same image are available via World Wide Web from URL
http://www.stsci.edu/pubinfo/Latest.html
http://www.stsci.edu/pubinfo/Pictures.html.

	GIF	JPEG
Surface Changes on Io	gif/Io9495.gif	jpeg/Io9495.jpg

DISK AROUND STAR BETA PICTORIS THINNER THAN THOUGHT

An image of a portion of a vast dust disk around the star Beta Pictoris shows that the disk is thinner than previously thought. Estimates based on the Hubble image place the disk's thickness at no more than one billion miles (600 million

kilometers), or about one fourth the previous estimates from ground-based observations. The disk is tilted nearly edge-on to Earth. Because the dust has had enough time to settle into a flat plane, the disk may be older than some previous estimates. A thin disk also increases the probability that comet-sized or larger bodies have formed through accretion in the disk. Both conditions are believed to be characteristic of a hypothesized circumstellar disk around our own Sun, which was a necessary precursor to the planet-building phase of our Solar System, according to current theory.

PHOTO NUMBER: B&W: 95-H-623 (no color)

Image files in GIF and JPEG format may be accessed on Internet via anonymous ftp from ftp.stsci.edu in /pubinfo.

The same images are available via World Wide Web from URL
http://www.stsci.edu/pubinfo/Latest.html
http://www.stsci.edu/pubinfo/Pictures.html.

	GIF	JPEG
Beta Pic Disk	gif/BetaPicS.gif	jpeg/BetaPicS.jpg

HUBBLE PROVIDES THE FIRST IMAGES OF SATURN'S AURORA

Hubble also has provided the first image ever taken of bright aurorae at Saturn's northern and southern poles, as seen in far ultraviolet light by the Wide Field and Planetary Camera 2. Hubble resolved a luminous, circular band centered on the north pole, where an enormous auroral curtain rises as far as 1,200 miles (2,000 kilometers) above the cloud tops. This curtain changed rapidly in brightness and extent over the two hour period of the Hubble observations, although the brightest emissions remained at a position fixed in sun angle, near "dawn" in the north auroral band. The image was taken on October 9, 1994, when Saturn was at a distance of 831 million miles (1.3 billion kilometers) from Earth. The aurora is produced as trapped charged particles precipitating from the magnetosphere collide with atmospheric gases -- molecular and atomic hydrogen in Saturn's case.

PHOTO NUMBER: color: 95-HC-608 B&W: 95-H-619
Image files in GIF and JPEG format may be accessed on Internet via anonymous ftp from ftp.stsci.edu in /pubinfo. The same images are available via World Wide Web from URL
http://www.stsci.edu/pubinfo/Latest.html
http://www.stsci.edu/pubinfo/Pictures.html.

	GIF	JPEG
Saturn Aurora	gif/SatAur.gif	jpeg/SatAur.jpg

HUBBLE MAPS THE ASTEROID VESTA

Two maps derived from images of the asteroid 4 Vesta were taken between November 28 and December 1, 1994, with Hubble's Wide Field Planetary Camera-2, showing surface details as small as 35 miles across. Vesta is 320 miles in diameter, and the map covers a surface area of 200,000 miles. The surface brightness map shows that, unlike most asteroids, Vesta's surface is significantly varied with a dark hemisphere and a light hemisphere. The surface markings may represent ancient igneous activity such as lava flows and, in addition, regions where major impacts have stripped away the crust revealing mantle material below. The surface composition map, (a false-color composite map), shows that all of Vesta's surface is igneous, indicating that either the entire surface was once melted, or lava flowing from its interior once completely covered its surface. The map shows that Vesta has two distinct hemispheres containing two different types of solidified lava called basalts.

PHOTO NUMBER: color: 95-HC-611 B&W: 95-H-622

Image files in GIF and JPEG format may be accessed on Internet via anonymous ftp from ftp.stsci.edu in /pubinfo. The same images are available via World Wide Web from URL: http://www.stsci.edu/pubinfo/Latest.html http://www.stsci.edu/pubinfo/Pictures.html.

	GIF	JPEG
Vesta Map	gif/VestaMap.gif	jpeg/VestaMap.jpg

HUBBLE FINDS OZONE ON JUPITER'S MOON GANYMEDE

Ozone, which protects Earth's life from harmful radiation is being manufactured one-half billion miles away, on Jupiter's largest satellite, Ganymede. Hubble found ozone's spectral "fingerprint" during observations of Ganymede made by Keith Noll and colleagues at the Space Telescope Science Institute, Baltimore, MD. The amount of ozone detected on Ganymede is small by "Earthly" standards. The total is only a tiny fraction (between 1-10 percent) of the amount of ozone destroyed each winter in Antarctica's "ozone hole" (a location on Earth where ozone levels seasonally drop to extremely low levels.)

Unlike ozone production in Earth's atmosphere, Ganymede's ozone is produced by charged particles trapped in Jupiter's powerful magnetic field (much like the Earth's Van Allen radiation belts). Jupiter's 9-hour, 59-minute rotation sweeps these particles along at tremendous speed, where they overtake

the slower moving Ganymede and "rain" down onto the surface. The charged particles penetrate the ice surface where they disrupt water molecules, but the exact steps leading to ozone production are not yet fully understood, according to Noll.

Though no atmosphere has yet been detected on Ganymede, "the evidence for all this oxygen chemistry going on in the surface ice is a strong hint that Ganymede also will turn out to have a tenuous oxygen atmosphere," said Noll. Earlier this year, Hubble detected a thin oxygen atmosphere on the Jovian moon Europa.

Ganeymede, Jupiter's largest moon (3,280 miles or 5,262 km in diameter; 1.5 times the size of the Earth's Moon), is thought to be composed of rock and ice beneath which lies a water/ice mantle and rocky core. (No images accompany this finding. An image of Ganymede is available in the "Jupiter Family Photo.")

The Space Telescope Science Institute is operated by the Association of Universities for Research in Astronomy, Inc. (AURA) for NASA, under contract with the Goddard Space Flight Center, Greenbelt, MD. The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency (ESA).

- end -

NASA press releases and other information are available automatically by sending an Internet electronic mail message to domo@hq.nasa.gov. In the body of the message (not the subject line) users should type the words "subscribe press-release" (no quotes). The system will reply with a confirmation via E-mail of each subscription. A second automatic message will include additional information on the service. Questions should be directed to (202) 358-4043.

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

October 12, 1995

Douglas Isbell
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Franklin O'Donnell
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

RELEASE: 95-182

GALILEO SPACECRAFT ANOMALY BEING INVESTIGATED

Engineering data returned from NASA's Jupiter-bound Galileo spacecraft last night indicates a problem with the spacecraft's tape recorder, project officials report.

Project officials say a week or more may be required for the problem to be isolated or well-understood, but that the spacecraft remains otherwise healthy and in contact with controllers on Earth.

The problem was detected shortly after Galileo took an image of Jupiter and its major moons from 22 million miles away. After taking the three images required for a color photograph to be produced, the tape recorder used to store the data was commanded to rewind. Data received from Galileo suggest the tape recorder did not stop as expected after rewinding.

"Galileo engineers have commanded the tape recorder to a standby mode while they investigate further," said Galileo Project Manager William J. O'Neil of NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA. Project engineers are proceeding slowly and cautiously to understand the problem, according to O'Neil, and are avoiding sending unnecessary commands to the spacecraft. In addition to analyzing spacecraft telemetry, engineers are working with an identical tape recorder in a laboratory spacecraft mockup on the ground.

"The next scheduled spacecraft operation that we need to perform is a routine thruster flushing in about two weeks," said O'Neil. "We want to take the time in the interim to understand this problem in detail."

-end-

News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

Brian Dunbar
Headquarters, Washington, DC
(Phone: 202/358-1600)

For Release

October 13, 1995

LAUNCH ADVISORY

NASA managers have postponed launch of Space Shuttle Columbia on Mission STS-73 to Sunday, Oct. 15, in order to work an issue with the Shuttle Main engine and another with the orbiter's onboard computer. The launch window opens at 9:46 a.m. EDT and extends until 12:16 p.m. EDT. The weather forecast for Sunday calls for a 70 percent chance of unacceptable conditions for launch, mostly due to potential cloud cover and cross wind conditions that are the after effects of Hurricane Roxanne.

The issue with the Shuttle main engines involves inspections that are required because of a crack found in a high pressure oxidizer duct on a main engine being tested at NASA's Stennis Space Center in Bay St. Louis, MS earlier this week. Inspection of the failed duct indicates the crack happened in a welded area where the duct wall was too thin.

Technicians will conduct ultrasonic inspection of the welds on each engine's high pressure oxidizer duct to ensure proper wall thickness. There are seven welds on each engine duct. The inspection work will begin later today.

A separate issue is being worked by the launch team with one of Columbia's General Purpose Computers (GPC). During prelaunch testing, the ground crew noticed an unusual response in the data transmission between the GPC and associated electronics hardware. Further evaluation will determine whether the GPC needs to be removed and replaced. If removal and replacement is needed, it would not affect Sunday's launch opportunity.

The schedule of significant events on Sunday starts at 1:20 a.m. EDT with the loading of 500,000 gallons of liquid hydrogen and liquid oxygen into the External Tank. The STS-73 crew will don their flight suits at about 5:41 a.m. EDT and depart for the launch pad at 6:21 a.m. EDT.

Shuttle managers plan to meet late Saturday afternoon to assess the status of both issues before making a final go for launch on Sunday morning.

- end -

News Release

National Aeronautics and
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Rob Navias
Johnson Space Center, Houston
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For Release
Oct. 16, 1995

NOTE TO EDITORS: N95-66

CREW BRIEFING CHANGED FOR SECOND SHUTTLE-MIR DOCKING MISSION

Due of the possibility of a conflict with the launch of Space Shuttle Columbia on the STS-73 mission, the STS-74 crew news conference, which had been scheduled for Friday, Oct. 20, has been rescheduled to Wednesday, Oct. 25, at 3 p.m. EDT at the Johnson Space Center (JSC), Houston.

The five astronauts who will fly the second Shuttle-Mir docking mission on STS-74 will discuss their mission and answer questions from reporters at participating NASA centers. The news conference will be carried live on NASA Television with two-way question-and-answer capability from participating locations.

After the news conference, reporters will have a chance to conduct local only, one-on-one round-robin interviews with the STS-74 astronauts at JSC. Interested media representatives should contact Kyle Herring or Eileen Hawley at the JSC Public Affairs Office at 713/483-5111 by close of business Oct. 23.

NASA Television is located at Spacenet 2, Transponder 5, Channel 9 at 69 degrees West longitude. The transponder frequency is 3880 Mhz and the audio subcarrier is 6.8 Mhz. Polarization is horizontal.

-end-

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Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

October 16, 1995

VIDEO ADVISORY: V95-153

F16-XL SUPERSONIC LAMINAR FLOW EXPERIMENT ON NTV

On Friday NASA's Dryden Flight Research Center conducted a flight test of a specially modified F16-XLwing panel that may lead to a revolutionary improvements in aerodynamics and fuel consumption on large future supersonic aircraft. The goal of the new wing fitting is to help aircraft achieve what is called laminar, or smooth, airflow over the surface of an aircraft's wing while it is flying faster than the speed of sound. *Video News Files are aired each day at noon, 3, 6 and 9 p.m. EDT.*

ITEM #1: ANIMATION -- LAMINAR FLOW TECHNOLOGY
Animation of optimum laminar flow.

ITEM #2: INTERVIEW -- JEFFREY LAVELL, F16-XL EXPERIMENT
Manager of F16-XL experiment discusses purpose of studying the Laminar Flow.

Also on Tuesday, STS-74 Space Shuttle mission briefings will be aired from 10:15 a.m. - noon EDT, and from 12:05 p.m. - 2:45 p.m. EDT. STS-74, due to launch in early November, will be the second Shuttle-Mir docking mission.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

News Release

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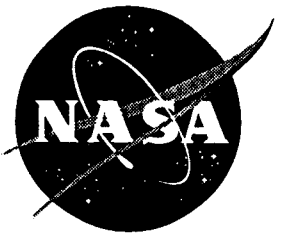

For Release

Jim Cast
Headquarters, Washington, DC
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October 18, 1995

RELEASE: 95-183

NASA ANNOUNCES 1995 SBIR PHASE I SELECTIONS

NASA today announced the selection of 304 research proposals for immediate negotiation of Phase I contracts in the Agency's 1995 Small Business Innovation Research Program (SBIR).

The 1995 solicitation closed on July 11. NASA received 1,947 proposals submitted by small, high technology businesses from across the United States. The combined award total for the 304 Phase I contracts is expected to be about $21 million.

The SBIR program seeks proposals directed at specific NASA needs. SBIR proposals are focused on meeting NASA mission requirements and further developing the proposed technology into commercial products and services. The SBIR program objectives are to stimulate technological innovation in the United States by using small businesses, including minority and disadvantaged firms, to meet federal research and development needs and to encourage commercial applications of federally supported research innovations.

The nine NASA field centers, the Jet Propulsion Laboratory and NASA Headquarters reviewed proposals for technical merit and feasibility and relevance to NASA research or technology requirements. The selected firms will be awarded fixed-price contracts valued up to $70,000 each to perform a six-month Phase I feasibility study.

Companies which successfully complete the Phase I activities are eligible to compete for Phase II selection the following year. The Phase II award allows for a two-year, fixed-price contract in the amount of $600,000.

In October 1992, the President signed legislation re-authorizing the SBIR program. As part of this new legislation, award authority was increased and greater emphasis has been placed on the development of commercial products and services.

- end -

EDITOR'S NOTE: A listing of companies selected for this program can be accessed electronically at: 1-800-547-1811, and can be accessed on the Internet at ftp://coney.gsfc.nasa.gov/pub/sbir/awards/text/95ph1.txt. A limited quantity of printed company listings is also available through the NASA Headquarters Newsroom: 202/358-1600. A rundown of awards by NASA installation follows.

AWARD DISTRIBUTION BY NASA INSTALLATION

INSTALLATION	AWARDS	FIRMS
Ames Research Center Moffett Field, CA	27	27
Dryden Flight Research Center, Edwards, CA	8	7
Goddard Space Flight Center Greenbelt, MD	41	41
Jet Propulsion Laboratory Pasadena, CA	38	32
Johnson Space Center Houston, TX	40	35
Kennedy Space Center Kennedy Space Center, FL	14	13
Langley Research Center Hampton, VA	41	38
Lewis Research Center Cleveland, OH	41	39
Marshall Space Flight Center Marshall Space Flight Ctr, AL	39	37
NASA Headquarters Washington, DC	8	7
Stennis Space Center Stennis Space Center, MS	7	7

News Release

National Aeronautics and
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For Release
October 17, 1995

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Keith Henry
Langley Research Center, Hampton, VA
(Phone: 804/864-6120)

RELEASE: 95-184

NASA FLIGHTS WILL TEST BREAKTHROUGH AIRPLANE CONCEPT

NASA has begun flight testing an experimental aircraft wing panel that may lead to a revolutionary way of improving the aerodynamics and fuel consumption on large future supersonic aircraft.

The goal of the project is to achieve what is called laminar, or smooth, air flow over the surface of an aircraft's wing while flying supersonic. Researchers say that laminar flow conditions can reduce aerodynamic drag, or friction, and contribute to reduced operating costs by improving fuel consumption and lowering aircraft weight.

If the NASA project is successful, a method of maintaining laminar flow control could be incorporated into the design of the High Speed Civil Transport (HSCT), a conceptual supersonic airliner of the future that would carry 300 passengers at 2.4 times the speed of sound.

"This is a very important event in the history of aerodynamics. If we are successful, supersonic laminar flow control will revolutionize flight," said Jeffrey Lavell, project manager of the F-16XL Supersonic Laminar Flow Control (SLFC) flight experiment at NASA Langley Research Center, Hampton, VA. Langley manages the project, which is part of the agency's High-Speed Research Program dedicated to producing technologies helpful to the development of a supersonic passenger jet.

-more-

Flights with the SLFC experiment are being carried out at NASA Dryden Flight Research Center, Edwards, CA, using an F-16XL, which has a large delta wing. The wing's shape is similar to the design that likely will be used on the HSCT, making the F-16XL an excellent testbed for the laminar flow research project.

A large panel, called a glove, has been attached to the upper surface of the test aircraft's left wing. The titanium panel has been perforated with more than 10 million laser-cut holes, while below the panel is a suction system linked to a compressor.

Natural aerodynamic drag on an aircraft wing is caused by the friction of a thin turbulent layer of air moving across the wing's surface. During coming research flights with the modified F-16XL, the suction system will pull that thin layer of turbulent air through the glove's porous surface to create a smooth laminar flow.

The area below the glove has been divided into 20 sections, and the strength of the suction in each compartment can be controlled individually to attain specified conditions during the research flights.

The manager of the SLFC project at Dryden, Marta Bohn-Meyer, said that up to 70 flights are planned, with as many as 30 to be flown before the end of 1995. Most of the research flights will be at speeds of Mach 2 (1,400 mph) and altitudes of 35,000 to 50,000 feet, the proposed range for the HSCT.

NASA project officials hope to have enough favorable data by December to give HSCT designers confidence to consider the use of SLFC when they meet then to study possible technologies to incorporate into that aircraft.

The SLFC experiment represents a collaborative effort between NASA and the aerospace industry. A team composed of Boeing, Rockwell and McDonnell Douglas designed the wing panel and suction system. The panel was assembled at a Boeing facility, Seattle, WA, while the suction system was fabricated by McDonnell Douglas, Long Beach, CA.

NOTE TO EDITORS: Color artist concepts of the HSCT are available by calling the Langley Research Center at 804/864-6123. Photos of the F16XL aircraft are available by calling the Dryden Flight Research Center at (805) 258-3449.

- end -

News Release

National Aeronautics and
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Washington, DC 20546
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Don Savage
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Jim Sahli
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For Release
October 18, 1995
Embargoed until
October 19, 1995

RELEASE: 95-185

FIRST "SNAPSHOT" TAKEN OF SHAPE OF INTERPLANETARY MAGNETIC FIELD

NASA physicists using an instrument aboard the European Space Agency's (ESA) Ulysses spacecraft have obtained the first instantaneous view, or "snapshot," of the spiral structure of our solar system's magnetic field.

These lines of magnetic force originate in the Sun and extend outward into the solar system. The "snapshot," assembled from observations of radio waves by a U.S.-French radio receiver on Ulysses, shows the spiral magnetic field extending from the Sun past the orbit of the planet Venus toward the orbit of Earth. Scientists used the unique vantage point of Ulysses above the pole of the Sun and the plane of the planets to obtain this image.

The method to obtain the image involved tracking the path of the bright spot of radio waves excited by moving electrons ejected from the Sun at speeds over 62,100 miles per second. This spot was caused by solar flares or other explosive events on the Sun. "As the electrons speed out into the solar system, they are constrained to follow the large scale magnetic field lines similar to the way cars are constrained to follow roads," said Dr. Joseph Fainberg, Goddard Space Flight Center scientist.

"The radio emissions, caused by the fast electrons moving through with the slower solar wind, allow us to trace out the magnetic lines of force much like you might deduce the course of a road at night from an airplane by tracking the headlights of individual cars," said Dr. Michael Reiner, chief scientist at Hughs STX Co., Greenbelt, MD. "A chart of the received radio emissions shows that they follow the expected spiral shape, even including the kinks due to variations in solar wind speed. At these high speeds, the whole path takes about 20 minutes to Earth's orbit."

Previous radio observations made by space probes orbiting in or near the plane of the Earth's orbit did not provide a good vantage point for observing the spiral shape of the magnetic field. Observations in space are required because the radio frequencies of the solar wind do not get through the Earth's ionosphere.

-more-

"It was like trying to determine the shape of our Milky Way galaxy from our location inside," explains Dr. Robert Stone, a senior scientist at Goddard's Laboratory for Extraterrestrial Physics. "We could get fine photos of individual stars and star clusters, but no perspective on the whole system. What we needed was the equivalent of an aerial photo of our Milky Way galaxy."

"The aerial photo of the interplanetary magnetic field became possible with the flight of Ulysses over the south pole of the Sun in 1994," said Dr. Reiner. "Now we could look down on the solar system, and these radio observations made by Ulysses gave us the first direct observation of the spiral structure in space between the Sun and the Earth."

The radio receiver on board Ulysses used to make the new "snapshot" was developed in a cooperative effort with experts at the Paris Observatory in France, the University of Minnesota in Minneapolis, and Goddard. Dr. Stone led the project.

Ulysses was launched in October 1990. The spacecraft's course led it to the planet Jupiter, where in February 1992, it received a gravitational assist from the huge planet that sent it out of the plane of the Earth's orbit and eventually over the poles of the Sun. After passing over the south pole in October 1994, Ulysses continued on a trajectory that recently took it over the Sun's north pole.

The Ulysses mission is managed jointly by ESA and NASA to study the regions over the Sun's poles. NASA's Jet Propulsion Laboratory, Pasadena, CA, oversees the U.S. portion of the mission for NASA's Office of Space Science, Washington, DC.

A report on this "snapshot" appears in tomorrow's issue of the journal Science.

- end -

EDITORS NOTE: A color chart of the "snapshot" of the spiral interplanetary magnetic field is available to media representatives by calling the Headquarters Imaging Branch on 202/358-1900. Photo numbers are:
Color: 95-HC-617 B&W: 95-H-629

The image also is available on the Internet at the following location:
http://pao.gsfc.nasa.gov/gsfc/spacesci/pictures/spacepic.htm

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

October 19, 1995

Don Nolan-Proxmire
Headquarters, Washington, DC
(Phone: 202/358-1983)

Mike Mewhinney
Ames Research Center, Mountain View, CA
(Phone: 415/604-3937)

RELEASE: C95-r

MRJ CHOSEN FOR COMPUTER RESEARCH CONTRACT

NASA has awarded a $38.3 million five-year contract to MRJ, Inc., of Fairfax, VA, to provide research and development support for the National Aerodynamic Simulation Program at NASA's Ames Research Center, Mountain View, CA.

Included in the cost-plus-award-fee contract are three primary functional responsibilities which will be performed by different teams. One team will conduct research towards and advanced development of applications which use highly parallel computers and hardware and software computing technologies relevant to scientific visualization.

Another team will conduct study and analysis, prototyping, specification, integration, testing, acceptance, initial operation prior to production turnover and documentation of complex systems in the areas of highly parallel computing, high speed processing and applications analysis, networking and communications, visualization, storage and other software projects.

The final contractual responsibility involves system administration and evaluation, software development and various operational tasks primarily in support of advanced, high performance, highly parallel computing systems.

-end-

Video Advisory

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

October 19, 1995

VIDEO ADVISORY: V95-154

LIVE COVERAGE OF SPACE SHUTTLE COLUMBIA LAUNCH FRIDAY

NASA TV will provide live coverage of the launch of Space Shuttle Columbia, due to lift off from the Kennedy Space Center, FL, at 9:50 a.m. EDT. The STS-73 USML-2 mission will take a crew of seven into orbit for a 16 day mission to conduct research in the unique microgravity environment space provides. Daily video news feeds will resume after the landing of Columbia.

STS-73 Mission Information Contacts:

Kennedy Space Center Newsroom	407/867-2468	(launch, landing)
Johnson Space Center Newsroom	713/483-5111	(mission control)

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

MISSION INFORMATION AVAILABLE VIA THE INTERNET:

Shuttle background information as well as daily mission updates can be accessed via the Internet and the World Wide Web at the Space Shuttle home page. The URL is:

http://shuttle.nasa.gov

Shuttle sighting opportunities, payload and crew information, as well as daily photo images can also be accessed at this site.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
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For Release
October 19, 1995

RELEASE: 95-186

NASA HELPS LOUISIANA COMPANY RECYCLE TIRES FOR OTHER USES

NASA is working with a company to improve the process for recycling vehicle tires -- turning them into material for building new roads and other useful items that benefit our everyday lives.

NASA's Technology Transfer Office and engineers with Lockheed Martin Stennis Operations and Johnson Controls World Services, Inc., at the John C. Stennis Space Center, LA, have been working with Cryopolymers Inc., St. Francisville, LA, to take shredded tires, freeze them and separate the rubber from reinforcing steel belts and polyester fibers. The next step in the process is to produce a material called "crumb," which can be used in asphalt road beds and other items.

"The Cryopolymers project is a prime example of how NASA technology and expertise can benefit the public," said Anne Johnson, NASA technology transfer officer at Stennis. "The results of such collaborations can create jobs, increase profits and enhance economic competitiveness for the United States."

Stennis personnel have been assisting Cryopolymers incorporate cryogenics, or the science of using super-cold fluids such as liquid nitrogen or liquid hydrogen, into its recycling process. Stennis utilizes 70 percent of all liquid hydrogen used by NASA. As NASA's Center of Excellence for large propulsion systems testing, Stennis has expertise in the handling and application of cryogenic materials.

The most practical method of making "crumb" involves using liquid nitrogen to freeze the rubber to a temperature of -225 degrees Fahrenheit. Since the company has only been in operation for a few months, and the liquid nitrogen used in their process is extremely expensive, Cryopolymers was anxious to learn how to reduce the amount of nitrogen used. Stennis assisted the company in adapting their equipment to work in these very cold temperatures and make better use of the cryogens.

-more-

"Stennis personnel have been a blessing. The technology is there and we are purchasing equipment based on their recommendations, " said Joe Kelley, director of community affairs for Cryopolymers.

The "crumb" that is created from the cryogenic process can be broken down into various grades according to particle size. Large particle crumb, which is the easiest material to process, is of less value and is typically used as a component to improve the wearability of a road surface. It also can be reprocessed to mold products which require little strength but must be weatherproof.

Fine crumb can be worth between 35 to 70 cents a pound and can contribute to making more expensive items such as new tires, agriculture hose, or mixed with plastics to produce culvert piping and bed liners for trucks. For each pound of rubber that is processed, approximately 60 percent is reduced into crumb. However, the scrap metal and polyester residue, called "fluff," also can be incorporated into new products as a reinforcing fiber.

The recycling of tires is beneficial in today's environmentally conscious society. The process not only has economic value, but also helps reduce the disposal problem of a worldwide production of more than 300 million tires per year. Cryopolymers is working toward reaching a production rate of 4,000 pounds of rubber per hour, which is more than 4,800 tires recycled a day.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

October 20, 1995

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Keith Koehler
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RELEASE: 95-187

NASA ROCKETS TO BE LAUNCHED IN AUSTRALIAN OUTBACK

A series of NASA sounding rocket experiments will begin today from the Australian Outback to study the Large Magellanic Cloud (LMC), the closest galaxy next to our own Milky Way.

Six sounding rocket experiments are scheduled for launch from the Woomera Instrumented Range in South Australia through November, carrying instruments to gather information on hot gases, stars, interstellar gas and dust particles, which are the basic building blocks of planets in our neighboring galaxy. In addition, the 10-minute rocket flights, from 150 to 200 miles altitude, will provide invaluable information on new detection technologies which are being incorporated into astronomy satellites.

The astronomical objects will be viewed by telescopes in the ultraviolet and x-ray wavelengths of light. The experiments in this campaign are from Penn State University, University of Wisconsin, University of Colorado, and Johns Hopkins University.

The flights are being conducted in Australia since the LMC can only be viewed from the Southern Hemisphere. The launches will be conducted by personnel from the NASA Goddard Space Flight Center's Wallops Flight Facility, Wallops Island, VA.

All of the experiments will fly on the two-stage Black Brant IX sounding rocket. Experiments will descend by parachute and be recovered. One experiment will be refurbished at the Woomera range for reflight about a week after it is recovered.

- more -

This will be NASA's first Australian sounding rocket campaign since 1987/88 when the Agency conducted six rocket experiments to study an exploding star, Supernova 1987a.

The NASA Sounding Rocket Program is managed by the Wallops Flight Facility for the Office of Space Science, NASA Headquarters, Washington, DC. Approximately 30 sounding rocket missions are conducted annually from sites world-wide.

- end -

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

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Franklin O'Donnell
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For Release
October 20, 1995

RELEASE: 95-188

GALILEO SPACECRAFT TAPE RECORDER TO BE TESTED

Engineers will transmit a series of commands to NASA's Jupiter-bound Galileo spacecraft today in an effort to assess the state of its balky onboard tape recorder.

The flight team, meanwhile, was buoyed by a preliminary assessment from Galileo's science team reporting that at least half the mission's original scientific objectives could be obtained in the event the tape recorder is found to be unusable.

The tape recorder, which is used mainly for onboard storage of imaging and spectral data from Galileo's instruments, apparently malfunctioned October 11. The problem was detected shortly after Galileo, due to reach Jupiter on December 7, took three consecutive images through different filters to produce a color image of Jupiter and its major moons. The tape recorder failed to stop rewinding as expected after recording the imaging data. Commands were sent to halt the tape recorder, which has since remained in a standby mode.

"For the past week, we've looked in detail both at data from the spacecraft and from an identical tape recorder in the testbed laboratory here," said Galileo Project Manager William J. O'Neil at NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA. "We've identified a number of both mechanical and electrical failures in the tape recorder system that could explain this problem. Our efforts today and in coming days will help us determine whether the tape recorder can be restored to operation."

Commands will be radioed to the spacecraft this afternoon to play back a small sample of data stored on the tape recorder. The tape-recorded data, along with engineering data reporting on the recorder's performance, first will be stored in memory located in Galileo's central data subsystem, then transmitted to the receiving stations of NASA's Deep Space Network this evening.

-more-

"By early next week, we will be in a position to report the results of our efforts to operate the tape recorder," said O'Neil. "Successful commanding of the device would still mean additional assessment and troubleshooting. Work concurrently continues on a backup plan to preserve the return of imaging and spectral data in the event the tape recorder cannot be used," he added.

Galileo's tape recorder and the spacecraft's guidance control computer were called into service as data compression and storage links, in a sophisticated alternative method devised to maximize data return from Jupiter after Galileo's main high-gain antenna failed to open properly. Loss of the high-gain antenna meant that all spacecraft communications must be conducted at much lower data rates through a low-gain antenna.

New techniques have been developed to edit, compress and encode Galileo's data, including images, in the spacecraft's computers, then store that data for playback to Earth. Additionally, new hardware and software changes at ground receiving stations have been installed to further increase the amount of data transmitted from Galileo's low-gain antenna.

Project Scientist Dr. Torrence Johnson of JPL reports that at least 50 percent of the mission's original science objectives could still be achieved if the tape recorder is found not to be working.

"The impact of a possible loss of the tape recorder is not as bad as people assumed when we first heard about the problem," said Johnson. "Even without the tape recorder, we have an exciting mission that allows us to address all our primary objectives. Although the total number of pictures and spectra we receive would be lower than with a tape recorder, we would still have enough to do the job."

According to Johnson, among the mission's three major areas of science investigations, it is the data return from remote sensing instruments such as cameras and spectrometers that would be impacted most by loss of the tape recorder. Data from these instruments can be saved by re-routing them directly to memory areas in the flight computer.

"The mission will still study all aspects of the Jovian system -- Jupiter's atmosphere, its moons and its magnetic environment -- and we plan to make a majority of the scientific measurements that had already been planned," said Johnson.

One hundred percent of the atmospheric probe's science objectives can be achieved without the tape recorder, in addition to all of the Galileo orbiter's survey of the Jovian magnetic and charged-particle environment, Johnson said.

"The principal loss of data, if the tape recorder is not usable, would be the number of images and other high-rate spectral data that could be returned by the spacecraft," said Johnson. Galileo spacecraft and software engineers, however, are devising new backup methods to store imaging and spectral data in available memory areas within the spacecraft's central data processor.

Preliminary assessments indicate that at least 150 to 300 high-resolution images of the Galilean moons of Jupiter and additional hundreds of Jupiter and Io volcanoes-monitoring images could be returned over the course of Galileo's two-year orbital tour.

The Galileo mission consists of an orbiter spacecraft and an atmospheric probe, which was released from the orbiter in July. The probe will parachute into and directly sample Jupiter's atmosphere on December 7. Its data will be radioed to the Galileo orbiter overhead. Also on December 7, shortly after the completion of the probe's mission, the Galileo orbiter's rocket engine will fire to brake the spacecraft into orbit around Jupiter, beginning a two-year detailed study of the Jovian system.

- end -

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Internet Advisory

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

October 23, 1995

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Goddard Space Flight Center, Greenbelt, MD
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INTERNET ADVISORY: I95-14

TOTAL SOLAR ECLIPSE "MOVIES" AVAILABLE ON INTERNET

Images of a total solar eclipse will be available in near-real-time on the Internet starting in the early morning hours of October 24 (EDT).

The total eclipse will be visible in a narrow path extending from Asia through the central Pacific Ocean on October 24. The Japanese spacecraft Yohkoh with its U.S./Japan Soft X-Ray Telescope will pass through the shadow cast by the Moon and will send back images of the eclipse. Yohkoh's orbital path will take it through the shadow cast by the Moon. However, Yohkoh's view of the Sun will never be totally obscured by the Moon -- the spacecraft will be seeing only a partial solar eclipse -- as will viewers on Earth more than a few kilometers from the path of totality.

These partial eclipse views will be available as QuickTime movies (which will be in flattened QuickTime format, so they can be displayed on Macintosh, Windows PC's with QuickTime for Windows [free via anonymous ftp from Apple], or Unix machines with the freeware Xanim movie player) on the World Wide Web at the following URL:

http://umbra.nascom.nasa.gov/eclipse/images/eclipse_images.html#19951024

After Tuesday, NASA also will be posting Yohkoh still images of the eclipse at the same URL as they become available. In addition, NASA TV will broadcast the images as soon as time permits.

-end-

NASA press releases and other information are available automatically by sending an Internet electronic mail message to domo@hq.nasa.gov. In the body of the message (not the subject line) users should type the words "subscribe press-release" (no quotes). The system will reply with a confirmation via E-mail of each subscription. A second automatic message will include additional information on the service. Questions should be directed to (202) 358-4043.

News Release

National Aeronautics and
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Washington, DC 20546
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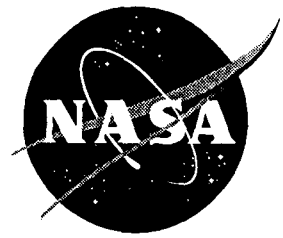

For Release

Douglas Isbell
Headquarters, Washington, DC
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October 23, 1995

RELEASE: 95-189

NASA AND CNES SELECT SCIENCE INVESTIGATIONS FOR COMET LANDER

Science investigations designed to image the surface of a comet close up and determine its exact chemical and mineralogical composition have been provisionally selected by NASA and CNES, the French space agency, to be carried out early next century on a comet lander named Champollion.

Slated for launch aboard the International Rosetta Mission, Champollion and a similar comet lander named RoLand, to be provided by a German-led consortium, will be the first spacecraft ever to land on one of these ancient clumps of icy rubble.

Planetary scientists believe that comets were the primary building blocks for the outer planets of the solar system. Cometary bombardment also may have provided a significant fraction of the atmosphere, oceans and organic materials of Earth when it was a young planet.

The overall scientific objective of the Rosetta mission is to produce a global picture of a comet called Wirtanen, including its shape and composition, the nature of the volatiles that it spews out, and the comet surface phenomena that contribute to this process.

The mission is named after the Rosetta Stone, an ancient Egyptian tablet discovered near the town of Rosetta in 1799 that provided a major key to the translation of Egyptian hieroglyphic writing. Jean-Francois Champollion of France, for whom one of the Rosetta mission comet landers is named, played a large part in deciphering it.

"The new knowledge about comets that Rosetta and Champollion promise to return will help us decipher important clues about the earliest stages of the formation of our solar system, just as the Rosetta Stone did with ancient Egyptian hieroglyphics," said Dr. Wesley T. Huntress, Associate Administrator for Space Science, NASA Headquarters, Washington D.C. "The most intriguing potential result from Champollion's investigations is the possible presence of complex organic molecules, which would tell us whether these precursors of life might have been brought to Earth by comets."

-more-

Rosetta will be the first spacecraft to orbit a comet. It represents the next major step in cometary science, following several recent reconnaissance flybys of comets by other international spacecraft. Rosetta is the third cornerstone mission in the European Space Agency's long-term space science program called Horizon 2000.

After its scheduled launch aboard an Ariane 5 vehicle in January 2003, the Rosetta spacecraft will perform gravity-assist flybys of Mars and Earth, and then rendezvous with comet Wirtanen in August 2011. It will deploy the Champollion and RoLand surface landers about one year later. Two asteroid flyby encounters also are planned for about halfway through the mission.

The selected Champollion experiments incorporate a number of new technologies, including high-density, three-dimensional electronics, an advanced infrared spectrometer, active pixel imaging sensors with on-chip electronics, an advanced gamma-ray sensor, and a miniaturized, low-power gas chromatograph/mass spectrometer.

A suite of a dozen cameras will provide Earth-bound scientists with their first close-up look at the surface of a comet. One set of cameras, to be provided by Dr. Jean-Pierre Bibring of the Institut d'Astrophysique Spatiale in Orsay, France, will create stereo images of the landscape surrounding the lander. A second camera set supplied by Dr. Roger Yelle of Boston University, Boston, MA, will photograph the surface close to the lander. An even closer look will be generated by a microscope, also supplied by Yelle, which should reveal individual grains in the comet nucleus.

Organic molecules, which may provide clues to the origin of life on Earth, will be identified by a gas chromatograph/mass spectrometer to be contributed by a group led by Dr. Paul Mahaffy of NASA's Goddard Space Flight Center, Greenbelt, MD. Determining the chemical composition of the comet itself is the task of an international consortium headed by Dr. Claude d'Uston of the Centre d'Etude Spatiale des Rayonnements in Toulouse, France. They will use a gamma-ray spectrometer to measure the radiation generated from inside the comet by the cosmic rays that bombard it continuously.

The strength, density and temperature of the comet surface will be measured by probes placed on spikes driven into the surface. These spikes, to be provided by Dr. Thomas Ahrens of the California Institute of Technology, Pasadena, CA, will also serve to anchor the spacecraft firmly to the comet and prevent it from drifting off into space.

The scientific investigators for the provisionally selected instruments are based at 10 U.S. universities, three NASA field centers, three other U.S. laboratories, 10 French institutes, and nine institutes in other countries.

A radio sounding tomographic experiment that would produce a CAT scan-like, three-dimensional image of the comet nucleus is under consideration as an additional Champollion investigation, if financial and technical resources can be made available. It would be provided by Dr. Wlodek Kofman of the Centre d'Etude des Phenomenes Aleatoires et Geophysiques, St. Martin d'Heres, France.

Full confirmation of the Champollion instrument payload is anticipated in about one year, after a formal review and endorsement by the ESA Space Program Committee in February 1996, and verification by NASA and CNES that the selected investigators are able to accommodate changes required to increase instrument collaboration and decrease their costs.

The Champollion project is managed by NASA's Jet Propulsion Laboratory, Pasadena, CA, for the Solar System Exploration Division of NASA's Office of Space Science, Washington, DC, and the CNES Scientific Program Division, Paris. CNES will contribute several key elements of the mission, including its telecommunication subsystem, batteries, spacecraft separation mechanism, and its ground-based control system.

-end-

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release

November 2, 1995

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RELEASE: 95-190

EMBRYONIC STARS EMERGE FROM INTERSTELLAR "EGGS"

Dramatic new pictures from NASA's Hubble Space Telescope show newborn stars emerging from dense, compact pockets of interstellar gas called evaporating gaseous globules (EGGs). Hubble found the "EGGs," appropriately enough, in the Eagle nebula, a nearby star-forming region 7,000 light-years away in the constellation Serpens.

"For a long time astronomers have speculated about what processes control the sizes of stars -- about why stars are the sizes that they are," says Jeff Hester of Arizona State University, Tempe. "Now we seem to be watching at least one such process at work right in front of our eyes."

Pictures taken by Hester and co-investigators with Hubble's Wide Field Planetary Camera-2 (WFPC2) resolve the EGGs at the tip of finger-like features protruding from monstrous columns of cold gas in the Eagle nebula (also called M16 -- 16th object in the Messier column). The columns -- dubbed "elephant trunks" -- protrude from the wall of a vast cloud of molecular hydrogen, like stalagmites rising above the floor of a cavern. Inside the gaseous towers, which are light-years long, the interstellar gas is dense enough to collapse under its own weight, forming young stars that continue to grow as they accumulate more and more mass from their surroundings.

Hubble gives a clear look at what happens as a torrent of ultraviolet light from nearby young, hot stars heats the gas along the surface of the pillars, "boiling it away" into interstellar space -- a process called "photoevaporation." The Hubble pictures show photoevaporating gas as ghostly streamers flowing away from the columns. But not all of the gas boils off at the same rate. The EGGs, which are denser than their surroundings, are left behind after the gas around them is gone.

-more-

"It's a bit like a wind storm in the desert," said Hester. "As the wind blows away the lighter sand, heavier rocks buried in the sand are uncovered. But in M16, instead of rocks, the ultraviolet light is uncovering the denser egg-like globules of gas that surround stars that were forming inside the gigantic gas columns."

Some EGGs appear as nothing but tiny bumps on the surface of the columns. Others have been uncovered more completely, and now resemble "fingers" of gas protruding from the larger cloud. (The fingers are gas that has been protected from photoevaporation by the shadows of the EGGs). Some EGGs have pinched off completely from the larger column from which they emerged, and now look like teardrops in space.

By stringing together these pictures of EGGs caught at different stages of being uncovered, Hester and his colleagues from the Wide Field and Planetary Camera Investigation Definition Team are getting an unprecedented look at how stars and their surroundings appear before they are truly stars.

"This is the first time that we have actually seen the process of forming stars being uncovered by photoevaporation," Hester emphasized. "In some ways it seems more like archaeology than astronomy. The ultraviolet light from nearby stars does the digging for us, and we study what is unearthed."

"In a few cases we can see the stars in the EGGs directly in the WFPC2 images," says Hester. "As soon as the star in an EGG is exposed, the object looks something like an ice cream cone, with a newly uncovered star playing the role of the cherry on top."

Ultimately, photoevaporation inhibits the further growth of the embryonic stars by dispersing the cloud of gas they were "feeding" from. "We believe that the stars in M16 were continuing to grow as more and more gas fell onto them, right up until the moment that they were cut off from that surrounding material by photoevaporation," said Hester.

This process is markedly different from the process that governs the sizes of stars forming in isolation. Some astronomers believe that, left to its own devices, a star will continue to grow until it nears the point where nuclear fusion begins in its interior. When this happens, the star begins to blow a strong "wind" that clears away the residual material. Hubble has imaged this process in detail in so-called Herbig-Haro objects.

Hester also speculated that photoevaporation might actually inhibit the formation of planets around such stars. "It is not at all clear from the new data that the stars in M16 have reached the point where they have formed the disks that go on to become solar systems," said Hester, "and if these disks haven't formed yet, they never will."

Hester plans to use Hubble's high resolution to probe other nearby star-forming regions to look for similar structures. "Discoveries about the nature of the M16 EGGs might lead astronomers to rethink some of their ideas about the environments of stars forming in other regions, such as the Orion Nebula," he predicted.

The Space Telescope Science Institute is operated by the Association of Universities for Research in Astronomy, Inc., for NASA, under contract with the Goddard Space Flight Center, Greenbelt, MD. The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency.

EDITOR'S NOTE: Three images depicting the dramatic pillars in the Eagle Nebula and "EGGs" are available to news media representatives by calling the Headquarters Imaging Branch at 202/358-1900. NASA Photo Numbers are:

	Color	**B&W**
M16 3 Pillars	95-HC-631	95-H-643
M16 1 Pillar	95-HC-632	95-H-644
M16 B&W Detail		95-H-645

Image files in GIF and JPEG format and captions may be accessed on the Internet via anonymous ftp from ftp.stsci.edu in /pubinfo:

M16 3 Pillars	gif/M16Full.gif	jpeg/M16Full.jpg
M16 1 Pillar	gif/M16WF2.gif	jpeg/M16WF2.jpg
M16 B&W Detail	gif/M16HaBW.gif	jpeg/M16HaBW.jpg

Higher resolution versions (300 dpi JPEG) of the release photographs will be available temporarily in /pubinfo/hrtemp: 95-44a.jpg, 95-44b.jpg and 95-44c.jpg.

GIF and JPEG images, captions and press release text are available via World Wide Web at URL http://www.stsci.edu/pubinfo/PR95/44.html, or via links in: http://www.stsci.edu/Latest.html and http://www.stsci.edu/pubinfo/Pictures.html.

-end-

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News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

October 24, 1995

Ed Campion
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Kyle Herring
Johnson Space Center, Houston
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RELEASE: 95-191

ASTRONAUT LAWRENCE TO REMAIN IN UNITED STATES

Astronaut Wendy Lawrence, scheduled to begin one year of training in Russia as backup to astronaut John Blaha, will remain in the United States after a determination was made that she did not meet the minimum height requirements to safely fit in a Soyuz descent vehicle.

Earlier this month, astronaut Scott Parazynski discontinued his Mir training when sitting height parameters raised concerns over his ability to fit safely in the Soyuz capsule. Lawrence was to begin her training in Russia in early October but remained in Houston as discussions about possible flexibility in the height requirements continued between U.S. and Russian space flight experts.

Shuttle managers have reviewed all the astronauts currently assigned or under consideration to be assigned to a Mir flight and are satisfied that the crew members scheduled to fly on board Mir are well within the physical requirements for the Soyuz capsule.

Replacements for both Parazynski and Lawrence will be named shortly. "Both Scott and Wendy are now eligible for assignment to a Shuttle flight," said David Leestma, Director, Flight Crew Operations.

- end -

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

October 25, 1995

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NOTE TO EDITORS: N95-67

NASA, NTSB SPONSOR SYMPOSIUM ON FATIGUE

State-of-the-art countermeasures to reduce fatigue-related transportation incidents and accidents will be discussed during a two-day national symposium beginning at 8:30 a.m. EST, November 1, at the Sheraton Premiere Hotel, Tysons Corner, VA.

Sponsored by NASA's Ames Research Center, Mountain View, CA, and the National Transportation Safety Board (NTSB), the symposium entitled "Managing Fatigue in Transportation," will address for the first time fatigue relating to drivers, airline crews, train crews, marine pilots, watchstanders, transportation companies, schedulers/dispatchers, enforcement agents, researchers, manufacturers and anyone entrusted with public safety.

NASA Ames Research Center's Fatigue Countermeasures Program has developed an Education and Training Module designed to explain the current state of knowledge about the physiological mechanisms underlying fatigue. The Module demonstrates how this knowledge can be applied to improving operator sleep, performance and alertness and offers countermeasure recommendations that are relevant for all modes of transportation.

Initiated in response to a 1980 Congressional request, the Fatigue Countermeasures Program examines potential safety issues related to human fatigue during air transport operations. Since the program began, NASA has conducted extensive research, including field studies, to document the effects of fatigue and to develop countermeasures.

The NTSB has investigated accidents in every mode of transportation in which the effects of fatigue, circadian factors and sleep loss have been found to be causal or contributory. Since 1972, the NTSB has issued nearly 80 fatigue related safety recommendations to the Department of Transportation, transportation operators, associations and unions.

-more-

Featured presenters will be Dr. Mark Rosekind, Ames Fatigue Countermeasures Program; Dr. David Dinges, University of Pennsylvania Medical School; Dr. William Dei Stanford University Medical School; Dr. Tom Roth, Henry Ford Hospital; Dr. Charles C Harvard University Medical School and Dr. Alan Pack, University of Pennsylvania Medi School.

-end-

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Wade Sisler
Headquarters, Washington, DC
(Phone: 202/358-1717)

For Release
October 25, 1995

NOTE TO EDITORS: N95-69

NASA ADMINISTRATOR'S SEMINAR SCHEDULED

"Probing the Primordial Constituents of Our Solar System," the next in a series of seminars to help shape a unified agenda for the future of NASA's space program, will be held at 3 p.m. EST, on Monday, October 30, 1995, in NASA Headquarter's west lobby auditorium, 300 E St., SW, Washington, DC.

Dr. Anita Cochran, University of Texas and Dr. Tobey Owen, University of Hawaii will explore new ideas about the roles of small bodies, including comets and asteroids, in shaping the evolution of our solar system. They also will describe current and future scientific probes, and will give their vision of the fundamental questions that need to be addressed over the next quarter-century concerning the nature of the solar system and our place in its evolution. Dr. Eugene Shoemaker, co-discoverer of Comet Shoemaker-Levy, will give a special closing to the seminar.

Dr. Cochran recently detected a large number of Kuiper Belt objects using the Hubble Space Telescope. Dr. Owen has written many books on planetary systems and the search for life in the universe.

The seminar series, initiated by NASA's Chief Scientist, Dr. France Anne Cordova, and introduced by NASA Administrator Daniel S. Goldin, will continue over the next year and will consider fundamental questions that bear on NASA's greatest challenges.

Media representatives who wish to cover the event with cameras should notify Wade Sisler by 1 p.m. EST on October 30.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Don Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

October 26, 1995

Fred Brown
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-7277)

NOTE TO EDITORS: N95-70

SOHO PRELAUNCH SCIENCE AND SPACECRAFT BRIEFING SET FOR OCT. 31

The upcoming Solar and Heliospheric Observatory (SOHO) mission will be the subject of a prelaunch science and spacecraft briefing scheduled at 9:30 a.m. EST, Oct. 31, 1995 from NASA's Goddard Space Flight Center, Greenbelt, MD.

SOHO is a project between the European Space Agency (ESA) and NASA, and is scheduled for launch aboard an Atlas IIAS launch vehicle from Cape Canaveral Air Station, FL, on Nov. 23, 1995.

Participants for the briefing will be:

- Dr. Roger Bonnet, Director of the Scientific Programme, ESA Headquarters, Paris
- Dr. Wesley Huntress, Jr., Associate Administrator, Office of Space Science, NASA Headquarters, Washington, DC
- Dr. Vincente Domingo, ESA SOHO Project Scientist
- Dr. Art Poland, NASA SOHO Project Scientist
- Dr. Richard Harrison, Principal Investigator, SOHO CDS Instrument
- Dr. Phillip Scherrer, Principal Investigator, SOHO MDI/SOI Instrument

Reporters covering the briefing from NASA Headquarters, participating NASA Centers and ESA Headquarters will be able to participate in the 2-way question-and-answer session.

- end -

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Ed Campion
Headquarters, Washington, DC
(Phone: 202/358-1780)

Bruce Buckingham
Kennedy Space Center, FL
(Phone: 407/867-2468)

October 26, 1995

NOTE TO EDITORS: N95-71

LAUNCH DATE SET FOR SECOND SHUTTLE-MIR DOCKING MISSION

NASA managers have set Nov. 11, 1995, as the official launch date for the STS-74 mission -- the second in a series of missions between the U.S. Space Shuttle and the Russian Space Station Mir.

The primary purpose of the Space Shuttle Atlantis STS-74 mission is the installation of a docking module that will improve clearance between the Shuttle and Mir's solar arrays during subsequent dockings. Atlantis' crew also will return to Earth experiment samples, equipment for repair and analysis and products manufactured on the station.

The Nov. 11 launch of Atlantis is planned for approximately 7:56 a.m. EST from Kennedy Space Center's Launch Complex 39-A. The actual launch time may vary by a few minutes based on calculations of Mir's precise location in space at the time of liftoff. The available launch period, or "window" to launch Atlantis, is approximately seven minutes each day.

The STS-74 mission is scheduled to last approximately eight days. Docking with Mir will occur on the fourth day of the flight. An on-time launch and nominal mission duration would have Atlantis and her crew returning to Earth on Nov. 19 with a landing at Kennedy Space Center's Shuttle Landing Facility, FL, at approximately 1:28 p.m. EST.

The STS-74 mission will be the 15th mission for Atlantis and the 73rd for the Space Shuttle system.

- end -

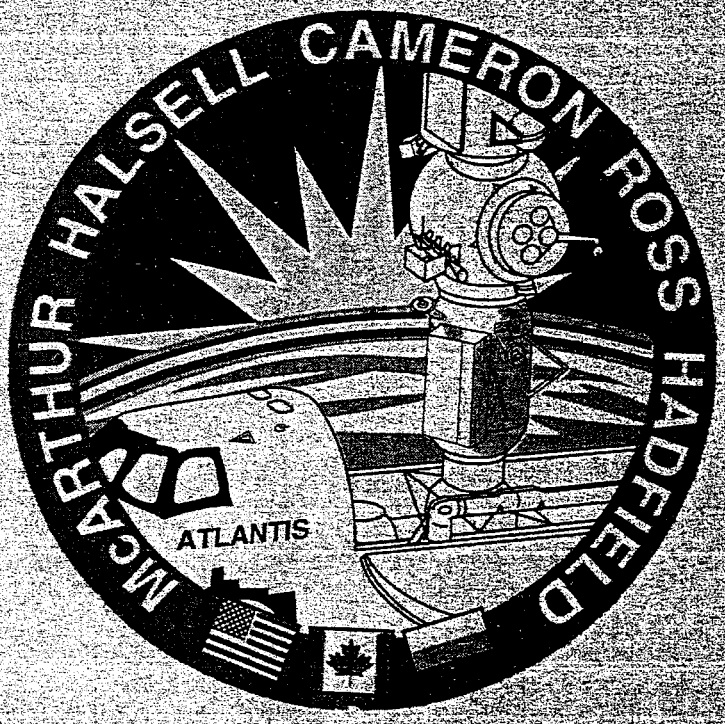
95-192

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SPACE SHUTTLE MISSION

STS-74

PRESS KIT
NOVEMBER 1995



Shuttle-Mir Mission-2

RELEASE: 95-192

U.S. SHUTTLE ATLANTIS AND RUSSIAN SPACE STATION MIR SET FOR SECOND MEETING IN SPACE

The world's two greatest spacefaring nations will again meet in Earth orbit when Space Shuttle Atlantis docks to the Mir Space Station in November.

The STS-74 mission is the second of seven planned Space Shuttle-Mir link-ups between 1995 and 1997, including rendezvous and docking and crew transfers, which will pave the way toward assembly of the international Space Station beginning in November 1997.

The STS-74 crew will be commanded by Kenneth Cameron, who will be making his third Shuttle flight. James Halsell will serve as pilot and will be making his second space flight. The three STS-74 mission specialists aboard Atlantis will include Canadian astronaut Chris Hadfield, Mission Specialist-1, who will be making his first flight, Jerry Ross, Mission Specialist-2, who will be making his fifth flight and William McArthur, Mission Specialist-3, who will be making his second space flight.

This mission marks the first time astronauts from the European Space Agency, Canada, Russia and the U.S will be in space on the same complex at one time -- a prime example of nations that will be represented on the international Space Station.

Launch of Atlantis on the STS-74 mission is currently targeted for no earlier than November 11, 1995, at approximately 7:56 a.m. EST from Kennedy Space Center's Launch Complex 39-A. The actual launch time may vary by a few minutes based on calculations of Mir's precise location in space at the time of liftoff, due to Shuttle rendezvous phasing requirements. The available launch period, or "window" to launch Atlantis, is approximately seven minutes each day.

The STS-74 mission is scheduled to last approximately 7 days, 20 hours, 47 minutes. Docking with Mir will occur on the fourth day of the flight, about 65 hours after launch.

STS-74's rendezvous and docking with the Mir actually begins with the precisely timed launch of Atlantis, setting it on a course for rendezvous with the Mir station. Over the next three days, periodic firings of Atlantis' small thruster engines will gradually bring the Shuttle closer to Mir.

Atlantis will carry the Russian-built Docking Module, which has multi-mission androgynous docking mechanisms at top and bottom. During the flight to Mir, the crew will use the Orbiter's Remote Manipulator System robot arm to hoist the Docking Module from the payload bay and berth its bottom androgynous unit atop Atlantis' Orbiter Docking System. Atlantis will then dock to Kristall using the Docking Module's top androgynous unit. After three days, Atlantis will undock from the Docking Module's bottom androgynous

unit and leave the Docking Module permanently docked to Kristall, where it will provide clearance between the Shuttle and Mir's solar arrays during subsequent dockings.

Atlantis will deliver water, supplies, and equipment, including two new solar arrays -- one Russian and one jointly-developed -- to upgrade the Mir. It will return to Earth experiment samples, equipment for repair and analysis and products manufactured on the station.

Also flying aboard Atlantis is the GPP payload consisting of two experiments -- the GLO-4 experiment and the Photogrammetric Appendage Structural Dynamics Experiment (PASDE). The payload is managed by Goddard Space Flight Center's Special Payloads Division.

The GLO-4 will study the Earth's thermosphere, ionosphere and mesosphere energetics and dynamics using broadband spectroscopy. GLO-4 also will study spacecraft interactions with the atmosphere by observing Shuttle and Mir glow, Shuttle engine firings, water dumps and fuel cell purges.

Three PASDE cannisters, located throughout the cargo bay, will photogrammetrically record structural response data of the Mir solar arrays during the docked phase of the mission. These data will be analyzed on the ground to verify the use of photogrammetric techniques to characterize the structural dynamics of the array, thus demonstrating that this technology can result in cost and risk reduction for the international Space Station on-orbit structural verification.

The STS-74 mission will be the 15th mission for Atlantis and the 73rd for the Space Shuttle system.

- end -

Media Services Information

NASA Television Transmission

NASA television is available through the Spacenet-2 satellite system. Spacenet-2 is located on Transponder 5, at 69 degrees West longitude, frequency 3880.0 MHz, audio 6.8 MHz.

The schedule for television transmissions from the Orbiter and for mission briefings will be available during the mission at Kennedy Space Center, FL; Marshall Space Flight Center, Huntsville, AL; Dryden Flight Research Center, Edwards, CA; Johnson Space Center, Houston, and NASA Headquarters, Washington, DC. The television schedule will be updated to reflect changes dictated by mission operations.

Television schedules also may be obtained by calling COMSTOR 713/483-5817. COMSTOR is a computer database service requiring the use of a telephone modem. A voice update of the television schedule is updated daily at noon Eastern time.

Status Reports

Status reports on countdown and mission progress, on-orbit activities and landing operations will be produced by the appropriate NASA newscenter.

Briefings

A mission press briefing schedule will be issued prior to launch. During the mission, status briefings by a Flight Director or Mission Operations representative and, when appropriate, representatives from the payload team, will occur at least once each day. The updated NASA television schedule will indicate when mission briefings are planned.

Internet Information

The NASA Headquarters Public Affairs Internet Home Page provides access to the STS-74 mission press kit and status reports. The address for the Headquarters Public Affairs Home Page is: **http://www.nasa.gov/hqpao/hqpao_home.html**

Informational materials, such as status reports and TV schedules, also are available from an anonymous FTP (File Transfer Protocol) server at **ftp.hq.nasa.gov/pub/pao**. Users should log on with the user name "anonymous" (no quotes), then enter their e-mail address as the password. Within the /pub/pao directory there will be a "readme.txt" file explaining the directory structure.

STS-74 mission information also can be obtained on the Space Shuttle Home Page. The address is:

http://shuttle.nasa.gov

Pre-launch status reports from KSC are found under **ftp.hq.nasa.gov/pub/pao/statrpt/ksc**, and mission status reports can be found under **ftp.hq.nasa.gov/pub/pao/statrpt/jsc**. Daily TV schedules can be found under **ftp.hq.nasa.gov/pub/pao/statrpt/jsc/tvsked**.

Access by fax

An additional service known as fax-on-demand will enable users to access NASA informational materials from their fax machines. Users calling (202) 358-3976 may follow a series of prompts and will automatically be faxed the most recent Headquarters news releases they request.

STS-74 QUICK LOOK

Launch Date/Site:	November 1995/KSC Launch Pad 39-A
Launch Time:	TBD
Launch Window:	Approx. 7 minutes (dependent on planar requirements)
Orbiter:	Atlantis (OV-104) - 15th flight
Orbit Altitude/Inclination:	160 nautical miles/51.6 degrees (Docking Altitude, 213 nm)
Mir Docking:	TBD
Mir Undocking:	TBD
Mission Duration:	7 days, 20 hours, 47 minutes
Landing Date:	November 1995
Landing Time:	TBD
Primary Landing Site:	Kennedy Space Center, FL
Abort Landing Sites:	Return to Launch Site - KSC Transoceanic Abort Sites - Zaragoza, Spain Ben Guerir, Morocco Moron, Spain Abort-Once Around - KSC
Crew:	Ken Cameron, Commander (CDR) Jim Halsell, Pilot (PLT) Chris Hadfield, Mission Specialist 1 (MS 1) Jerry Ross, Mission Specialist 2 (MS 2) William McArthur, Mission Specialist 3 (MS 3)
Mir 20 Crew (aboard Mir):	Yuri Gidzenko, Commander Sergei Avdeyev, Flight Engineer Thomas Reiter, Cosmonaut-Researcher (ESA)
EVA Crewmembers: (if required)	Jerry Ross (EV 1), William McArthur (EV 2)
Cargo Bay Payloads:	Docking Module Orbiter Docking System IMAX Cargo Bay Camera GLO
In-Cabin Payloads:	SAREX DTOs/DSOs

Developmental Test Objectives/Detailed Supplementary Objectives
Risk Mitigation Experiments

DTO 301D:	Ascent Structural Capability Evaluation
DTO 307D:	Entry Structural Capability
DTO 312:	ET TPS Performance
DTO 414:	APU Shutdown Test
DTO 624:	Radiator Performance
DTO 700-10:	Orbiter Space Vision System Video Taping
DTO 700-11:	Orbiter Space Vision System Flight Unit Testing
DTO 805:	Crosswind Landing Performance
DTO 829:	Plume Impingement and Contamination
DTO 832:	Target of Opportunity Navigation Sensors
DTO 1118:	Photographic and Video Survey of the Mir Space Station
DTO 1120:	Mated Shuttle and Mir Free Drift Experiment
DTO 1122:	APAS Thermal Data
DSO 485:	Inter-Mars Tissue Equivalent Proportional Counter
DSO 487:	Immunological Assessment of Crewmembers
DSO 604:	Visual-Vestibular Integration as a Function of Adaptation
DSO 621:	In-Flight Use of Florinef to Improve Orthostatic Intolerance Postflight
DSO 901:	Documentary Television
DSO 902:	Documentary Motion Picture Photography
DSO 903:	Documentary Still Photography
RME 1301:	Mated Shuttle and Mir Structural Dynamics Test
RME 1305:	Assessment of Space Station Environment
RME 1306:	Mir Wireless Network Experiment
RME 1308:	Photogrammetric Appendage Structural Dynamics Experiment
RME 1310:	Shuttle/Mir Alignment Stability Experiment

STS-74 CREW RESPONSIBILITIES

Payloads	Prime	Backup
Docking Module	Ross	Hadfield
Orbiter Docking System	Hadfield	McArthur
Orbiter Space Vision System	Hadfield	McArthur
GLO/PASDE	Hadfield	Ross
SAREX	McArthur	Cameron, Ross
Electronic Still Camera	Halsell	Ross
Science and Logistics Transfers	Ross, Hadfield	Others
Water Transfer	Halsell	Hadfield, Cameron
Food Transfer	Ross	Halsell, Cameron
IMAX Cargo Bay Camera	Ross	Hadfield
Other Activities		
Remote Manipulator System	Hadfield	McArthur
Earth Observations	Hadfield	Ross
EVA (if needed)	Ross (EV 1)	McArthur (EV 2)
Intravehicular Crewmember	Halsell	
Rendezvous	McArthur	Hadfield, Ross
DTOs/DSOs/RMEs (Risk Mitigation Experiments)		
DTO 301D	Cameron	Halsell
DTO 307D	Cameron	Halsell
DTO 312	Cameron	Halsell
DTO 700-10	Hadfield	McArthur
DTO 829	McArthur	Hadfield
DTO 1118	Ross	Cameron
DTO 1120	Halsell	Cameron, Ross
DTO 1122	Halsell	Hadfield
DSO 485	Cameron	Halsell
RME 1301	Halsell	Cameron, Ross
RME 1303	Halsell	Cameron
RME 1305	Hadfield	Ross
RME 1306	McArthur	Cameron

SHUTTLE ABORT MODES

Space Shuttle launch abort philosophy aims toward safe and intact recovery of the flight crew, Orbiter and its payload. Abort modes for STS-74 include:

* **Abort-To-Orbit (ATO)** -- Partial loss of main engine thrust late enough to permit reaching a minimal 105-nautical mile orbit with the orbital maneuvering system engines.

* **Abort-Once-Around (AOA)** -- Earlier main engine shutdown with the capability to allow one orbit of the Earth before landing at the Kennedy Space Center, FL.

* **TransAtlantic Abort Landing (TAL)** -- Loss of one or more main engines midway through powered flight would force a landing at either Zaragoza, Spain; Ben Guerir, Morocco; or Moron, Spain.

* **Return-To-Launch-Site (RTLS)** -- Early shutdown of one or more engines, and without enough energy to reach a TAL site, would result in a pitch around and thrust back toward KSC until within gliding distance of the Shuttle Landing Facility.

PAYLOAD AND VEHICLE WEIGHTS

Vehicle/Payload	Pounds
Orbiter (Atlantis) empty and 3 SSMEs	173,191
Docking Module with Solar Arrays	9,011
Orbiter Docking System	4,016
Remote Manipulator System	994
GLO Experiment	648
IMAX Cargo Bay Camera	633
SAREX	28
Detailed Test/Supplementary Objectives	219
Risk Mitigation Experiments (RMEs)	83
Shuttle System at SRB Ignition	4,511,797
Orbiter Weight at Landing	205,000

MISSION SUMMARY TIMELINE

Flight Day One:
Launch/Ascent
OMS-2 Burn
Docking Module Activation
Rendezvous Burn

Flight Day Two:
RMS Checkout
EMU Checkout
Cabin Depress (for EVA Contingency)
Orbiter Space Vision System Checkout
Centerline Camera Alignment
Rendezvous Burns

Flight Day Three:
Orbiter Docking System Checkout
Docking Module Unberth and ODS Installation
ODS Preparation for Ingress
Cabin Repress
Rendezvous Tool Checkout
Rendezvous Burn

Flight Day Four:
Rendezvous and Docking
Hatch Opening and Welcome Ceremony
Supply Transfers

Flight Day Five:
Gift Exchange
Supply and Logistics Transfers
Risk Mitigation Experiments

Flight Day Six:
Supply and Logistics Transfers
Risk Mitigation Experiments
Crew News Conference

Flight Day Seven:
Farewell Ceremony
Hatch Closing
Undocking
Shuttle Flyaround of Mir Station
Separation Maneuver

Flight Day Eight:
Flight Control System Checkout
Reaction Control System Hot-Fire
Stowage of Mir Transfer Items
Cabin Stow

Flight Day Nine:
Deorbit Prep
Deorbit Burn
Entry
KSC Landing

STS-74 ORBITAL EVENTS SUMMARY

Exact times for major events on STS-74 and other Phase I Shuttle-Mir docking missions will not be determined until after launch because of the rendezvous requirements needed for Atlantis to reach the Mir space station.

U.S./RUSSIA SPACE COOPERATION

The International Space Station Program is Underway

The international Space Station will be the preeminent, permanent orbiting science institute in space. It is being developed and assembled in three phases, each designed to maximize joint space experience and permit early utilization and return on a large joint investment involving 13 nations.

In Phase I, Americans and Russians will work together in laboratories on Mir and the Shuttle. They will conduct joint spacewalks and practice Space Station assembly by adding new modules to Mir. American astronauts will live and work on Mir for months beside their Russian counterparts, amassing the first U.S. long-duration space experience since Skylab (1973-1974).

International Space Station Phase I began with Russian cosmonaut Sergei Krikalev's flight aboard the Space Shuttle Discovery in February 1994 on STS-60. In February 1995, on the STS-63 mission, Discovery flew around the Russian Mir space station with cosmonaut Vladimir Titov aboard. During the fly around, Discovery stopped 37 feet from Mir -- a rehearsal for the first docking between Space Shuttle Atlantis and Mir in June/July 1995.

In March 1995, U.S. astronaut Dr. Norman Thagard flew to Mir for a three-month plus stay with two Russian cosmonauts, arriving there March 16. Thagard and his Russian crew mates returned to Earth aboard Atlantis 115 days later during the STS-71 mission, which saw the first docking between the U.S. Space Shuttle and Mir.

Phase I Impact on Phases II and III

The goal of Phase I is to lay the groundwork for international Space Station Phases II and III. Phase II beginning in 1997 will place in orbit a core space station with a U.S. laboratory module, the first dedicated laboratory on the station.

The U.S. laboratory will be put to work during utilization flights beginning in 1999 with Phase III, while assembly continues. Phase III ends when assembly is complete (scheduled for mid-2002). At that time, astronauts and cosmonauts from many countries will commence full time space research on the international Space Station.

Phase I is contributing to the success of Phases II and III in four major areas:

- Americans and Russians are working together on Earth and in space, practicing for the future international Space Station

- Integration of U.S. and Russian hardware, systems, and scientific aims over a long period of time

- Risk reduction–mitigation of potential surprises in operations, spacecraft environment, spacewalks, and hardware exchange

- Early initiation of science and technology research

The Space Station Mir

Mir represents a unique capability -- an operational space station that can be permanently staffed by two or three cosmonauts. Visiting crews have raised Mir's population to six for up to a month.

Mir is the first space station designed for expansion. The 20.4-ton Core Module, Mir's first building block, was launched in February 1986. The Core Module provides basic services (living quarters, life support, power) and scientific research capabilities. It has two axial docking ports, fore and aft, for Soyuz-TM manned transports and automated Progress-M supply ships, plus four radial berthing ports for expansion modules.

To date, the Russians have added four expansion modules to the Mir core:

- **Kvant**. Berthed at the core module's aft axial port in 1987, the module weighs 11 tons and carries telescopes and equipment for attitude control and life support.

- **Kvant 2**. Berthed at a radial port since 1989, the module weighs 19.6 tons and carries an EVA airlock, two solar arrays, and science and life support equipment.

- **Kristall**. Berthed opposite Kvant 2 in 1990, Kristall weighs 19.6 tons and carries two stowable solar arrays, science and technology equipment, and a docking port equipped with a special androgynous docking mechanism designed to receive heavy (up to about 100 tons) spacecraft equipped with the same kind of docking unit. The androgynous unit was originally developed for the Russian Buran Shuttle program. Atlantis will use the androgynous docking unit on Kristall.

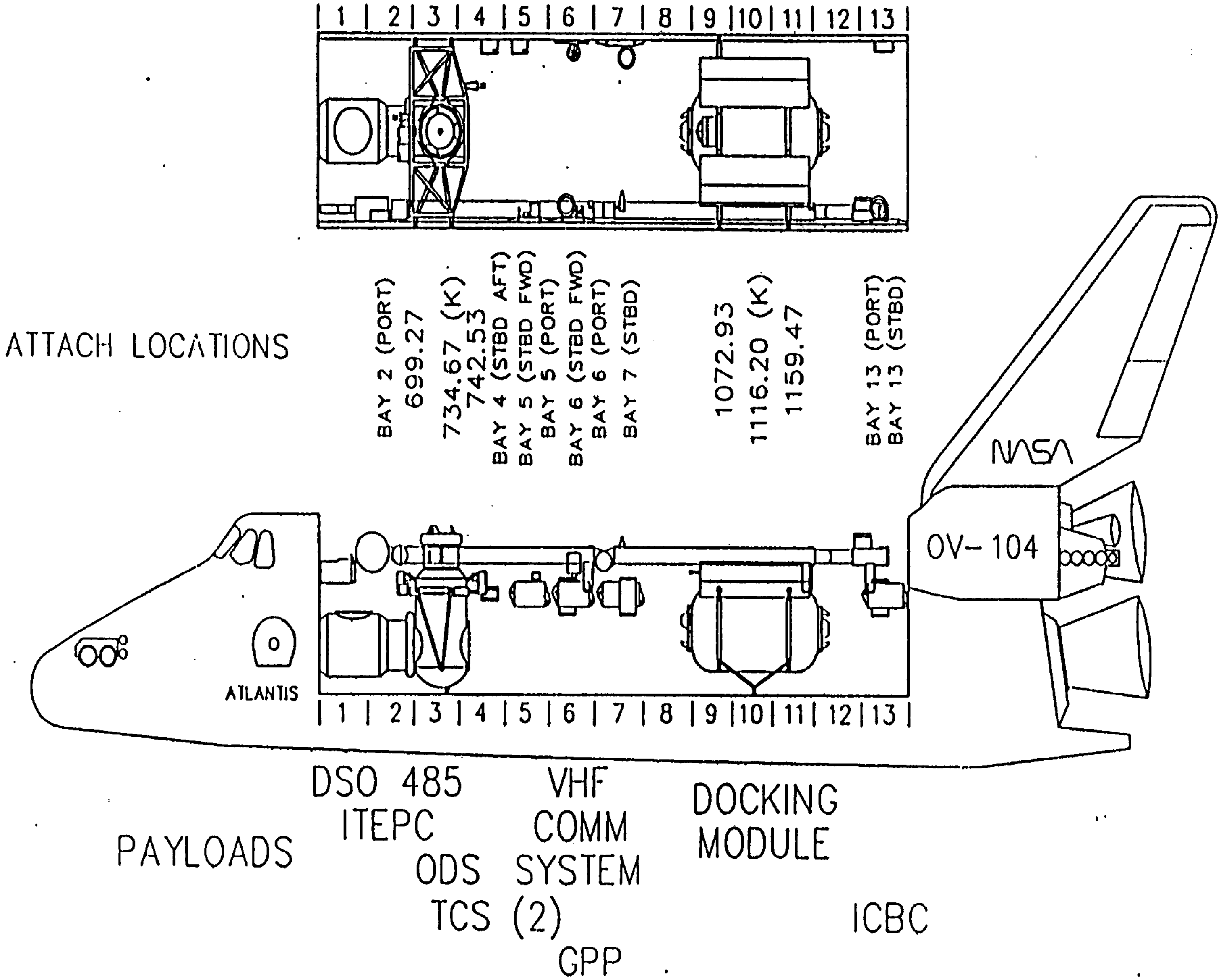
- **Spektr**. Launched on a Russian Proton rocket from the Baikonur launch center in central Asia, Spektr was lofted into orbit on May 20. The module was berthed at the radial port opposite Kvant 2 after Kristall was moved out of the way. Spektr carries four solar arrays and scientific equipment (including more than 1600 pounds of U.S. equipment).

Two more modules, all carrying U.S. equipment, will be added to Mir in 1995-96 for international Space Station Phase I:

- **Docking Module**. The module will be launched in the payload bay of Atlantis and berthed at Kristall's androgynous docking port during the STS-74 mission. The Docking Module will provide clearance for future Shuttle dockings with Mir and will carry two solar arrays — one Russian and one jointly developed by the U.S. and Russia -- to augment Mir's power supply.

- **Priroda**. Launch on a Russian Proton rocket is scheduled for Spring 1996. Priroda will berth at the radial port opposite Kristall and will carry microgravity research and Earth observation equipment (including 2,200 pounds of U.S. equipment).

After Priroda is added, Mir will have a mass of more than 100 tons. The station will consist of seven modules launched separately and brought together in space over 10 years. Experience gained by Russia during Mir assembly provides valuable experience for international Space Station assembly in Phases II and III.



CARGO ARRANGEMENT

Phase I Shuttle Mission Summaries

STS-60

Launch: Feb. 3, 1994
Landing: Feb. 11, 1994

This mission inaugurated international Space Station Phase I. Veteran Russian cosmonaut Sergei Krikalev served as a mission specialist aboard Discovery. He conducted experiments beside his American colleagues in a Spacehab laboratory module carried in Discovery's payload bay.

STS-63

Launch: Feb. 3, 1995
Landing: Feb. 11, 1995

Discovery maneuvered around Mir and stopped 37 feet from the Kristall module's special androgynous docking unit, which Atlantis used to dock with Mir on the STS-71 mission in June/July 1995. Cosmonauts on Mir and astronauts on Discovery beamed TV images of each other's craft to Earth. Cosmonaut Vladimir Titov served on board Discovery as a mission specialist, performing experiments beside his American colleagues in a Spacehab module in the Orbiter's payload bay.

For a time it appeared that minor thruster leaks on Discovery might keep the two craft at a pre-planned contingency rendezvous distance of 400 feet. However, mission control teams and management in Kaliningrad and Houston worked together to determine that the leaks posed no threat to Mir, so the close rendezvous proceeded. The minor problem became a major confidence builder and joint problem-solving experience for later international Space Station phases.

STS-71

Launch : June 27 1995
Landing : July 7, 1995,

Atlantis was launched with seven crew members -- five U.S. astronauts and two Russian cosmonauts -- and, in its payload bay, a Spacelab module and an Orbiter Docking System for docking with Mir. The Orbiter Docking System is a cylindrical airlock with a Russian-built androgynous docking mechanism on top. The Orbiter Docking System will be carried on all docking missions. For STS-71, Atlantis docked with an identical androgynous unit on Mir's Kristall module.

The Space Shuttle was used for the first time to change a space station crew, a task that will become a routine part of its duties in later international Space Station phases. Atlantis dropped off cosmonauts Anatoli Solovyev and Nikolai Budarin, and picked up Gennadi Strekalov, Vladimir Dezhurov, and U.S. astronaut Norman Thagard for return to Earth. They were launched from Russia in the Soyuz-TM 21 spacecraft on March 14.

Thagard and his Russian colleagues completed a 115-day stay on Mir. Thagard was the first U.S. astronaut to have a long-duration stay on-orbit since the last U.S. Skylab

mission in 1974. In fact, his mission broke the record for time on-orbit for a U.S. astronaut on June 6, 1995.

The joint crews carried out experiments similar to those planned for international Space Station Phases II and III. Atlantis was docked to Mir for five days.

STS-74
Planned launch: November 11,1995
Planned landing: November 19,1995

Atlantis will carry the Russian-built Docking Module, which has multi-mission androgynous docking mechanisms at top and bottom. During the flight to Mir, the crew will use the Orbiter's Remote Manipulator System robot arm to hoist the Docking Module from the payload bay and berth its bottom androgynous unit atop Atlantis' Orbiter Docking System. Atlantis will then dock to Kristall using the Docking Module's top androgynous unit. After two days, Atlantis will undock from the Docking Module's bottom androgynous unit and leave the Docking Module permanently docked to Kristall, where it will improve clearance between the Shuttle and Mir's solar arrays during subsequent dockings.

Atlantis will deliver water, supplies, and equipment, including two new solar arrays -- one Russian and one jointly-developed -- to upgrade the Mir. It will return to Earth experiment samples, equipment for repair and analysis and products manufactured on the station.

STS-76
Planned launch: March 1996

Atlantis will deliver U.S. astronaut Shannon Lucid to Mir for a five-month stay. The Orbiter will carry a Spacehab module in its payload bay and will remain docked to the Russian station for five days. Astronauts Linda Godwin and Rich Clifford will conduct the first U.S. spacewalk outside the Mir to attach four experiments to the station's docking module.

STS-79
Planned launch: August 1996

The Space Shuttle will pick up Lucid for her return to Earth and deliver her replacement, U.S. astronaut John Blaha, to Mir for approximately four months. U.S. astronauts will perform a spacewalk during the five-day docked phase. Atlantis will carry a Spacehab double module.

STS-81
Planned launch: December 1996

Blaha will return to Earth and astronaut Jerry Linenger will take up residence on Mir. Two Russians or an American and a Russian will perform U.S. experiments as part of a spacewalk during or after the five-day docked phase. Atlantis will carry a Spacehab double module.

STS-84
Planned launch: May 1997

Linenger, delivered on STS-81, will be picked up and another astronaut dropped off. Atlantis will carry a Spacehab double module and will remain docked to Mir for five days.

STS-86
Planned launch: September 1997

Atlantis will pick up the astronaut dropped off on STS-84 and deliver a joint U.S.-Russian solar dynamic energy module. As many as two spacewalks by U.S. astronauts and Russian cosmonauts will be needed to deploy the energy module outside Mir. The solar dynamic system will heat a working fluid that will drive a turbine, generating more electricity than current photovoltaic solar arrays. The Mir solar dynamic energy module will test the system for possible use on the international Space Station. In addition, developing the solar dynamic energy module will provide joint engineering experience.

SHUTTLE-MIR RENDEZVOUS AND DOCKING

STS-74's rendezvous and docking with the Russian space station Mir actually begins with the precisely timed launch of Atlantis on a course for the station, and, over the next four days, periodic small engine firings that will gradually bring Atlantis to a point eight nautical miles behind Mir, the starting point for a final approach to the station. The day before docking is planned, the crew will unberth and install the docking module scheduled to be left permanently attached to the Mir.

Docking Module Installation -- Flight Day Three

Prior to installation operations, several preliminary spacewalk preparations will have been completed by the crew to shorten the amount of time required to begin a spacewalk in case one is needed to assist with the docking module installation. These include depressurizing the crew cabin to 10.2 pounds per square inch and performing a standard checkout of spacesuit equipment early in the flight. Also, on Flight Day three, the Shuttle middeck will be prepared for a spacewalk in case one is required. The extravehicular activity crew members are Mission Specialists Jerry Ross and Bill McArthur. However, Ross and McArthur will not begin donning any spacesuit gear unless a spacewalk is actually deemed necessary.

To install the docking module on Flight Day three, Mission Specialist Chris Hadfield will first maneuver Atlantis' mechanical arm into position to attach to a grapple fixture mounted on the module. Next, latches will be released that have held the module horizontal in the payload bay for launch, and Hadfield will lift the module out of the bay. Above the bay, he will rotate the module to a vertical position.

Hadfield will then begin to precisely align the docking system at the end of the module with the Orbiter Docking System (ODS) on Atlantis. During this operation, the Orbiter Space Vision System (OSVS), a precise alignment system for the mechanical arm that is being tested on STS-74, will be evaluated as well. The OSVS, a Detailed Test Objective on STS-74, consists of a series of large dots placed on the exterior of the docking module and the ODS. Using digitized television camera views of the dots, the OSVS generates a display on a laptop computer aboard the Shuttle that indicates alignment both graphically and digitally. McArthur will oversee operations of the OSVS during the module installation.

For the installation, Hadfield, using a view from a camera mounted in the center of the ODS, will slowly lower the docking module toward the ODS, aligning it at a point about 30 inches above Atlantis' docking mechanism and pausing at that point. Next, he will lower it to a point only five inches above the docking ring. Atlantis' reaction control system jets will be turned off during these operations to avoid any inadvertent movement of the arm and module.

To engage the docking mechanism, Hadfield will put the arm into a test mode that essentially turns off brakes on the joints and leaves them free to move. With the arm in this limp mode, Commander Ken Cameron will reactivate Atlantis' steering jets and fire a short downward pulse to move Atlantis the final few inches to the module and engage the docking mechanism. Once the module is installed, it will be pressurized and leak checks

will be performed. Once these are complete, the arm will be detached from the module and moved to an extended park position overnight, and the centerline camera will be moved up to be mounted in the center of the module's docking mechanism.

Mir Rendezvous -- Flight Day Four

About two hours before the scheduled docking time on Flight Day Four of the mission, Atlantis will reach a point about eight nautical miles behind the Mir Space Station. Just prior to that time, the mechanical arm will be moved from the extended park position to a poised for docking position, extended out from the right-hand side of Atlantis. This position will allow the arm's elbow camera, a camera mounted at the middle arm joint, to be used by the crew for a lateral view of the docking mechanism and Mir approach. Also about this time, Atlantis' crew will begin air-to-air communications with the Mir 20 crew.

At a point eight nautical miles behind Mir, a Terminal Phase Initiation (TI) burn will be fired and the final phase of the rendezvous will begin. Atlantis will close the final eight nautical miles to Mir during the next orbit. As Atlantis closes in, the Shuttle's rendezvous radar system will begin tracking Mir and providing range and closing rate information to Atlantis.

As Atlantis closes the final eight nautical miles, the Shuttle will have the opportunity for four small successive engine firings to fine-tune its approach using its onboard navigation information. Identical to the STS-71 Mir rendezvous, Atlantis will aim for a point directly below Mir, along the Earth radius vector (R-Bar), an imaginary line drawn between the Mir center of gravity and the center of Earth. Approaching along the R-Bar, from directly underneath the Mir, allows natural forces to brake Atlantis' approach more than would occur along a standard Shuttle approach from directly in front of Mir. During this approach, the crew will begin using a handheld laser-ranging device to supplement distance and closing rate measurements made by Shuttle navigational equipment. Also, as Atlantis reaches close proximity to Mir, the Trajectory Control Sensor, a laser-ranging device mounted in the payload bay, will supplement the Shuttle's onboard navigation information by supplying additional data on the range and closing rate.

The manual phase of the rendezvous will begin just as Atlantis reaches a point about a half-mile below Mir when Cameron takes the controls. Cameron will fly the Shuttle using the aft flight deck controls as Atlantis begins moving up toward Mir. Because of the approach along the R-bar, from underneath Mir, Cameron will have to perform very few braking firings. However, if such firings are required, the Shuttle's jets will be used in a mode called "Low-Z," a technique that uses slightly offset jets on Atlantis' nose and tail to slow the spacecraft rather than firing jets pointed directly at Mir. This technique avoids contamination of the space station by exhaust from the Shuttle steering jets.

Using the centerline camera fixed in the center of the module's docking mechanism, Cameron will center the module docking device with the Mir docking device, continually refining this alignment as he approaches within 170 feet of the station. At 170 feet, Cameron will halt the approach while Mir maneuvers into docking attitude. After consulting with Russian flight controllers, NASA flight controllers will give Cameron permission to continue in.

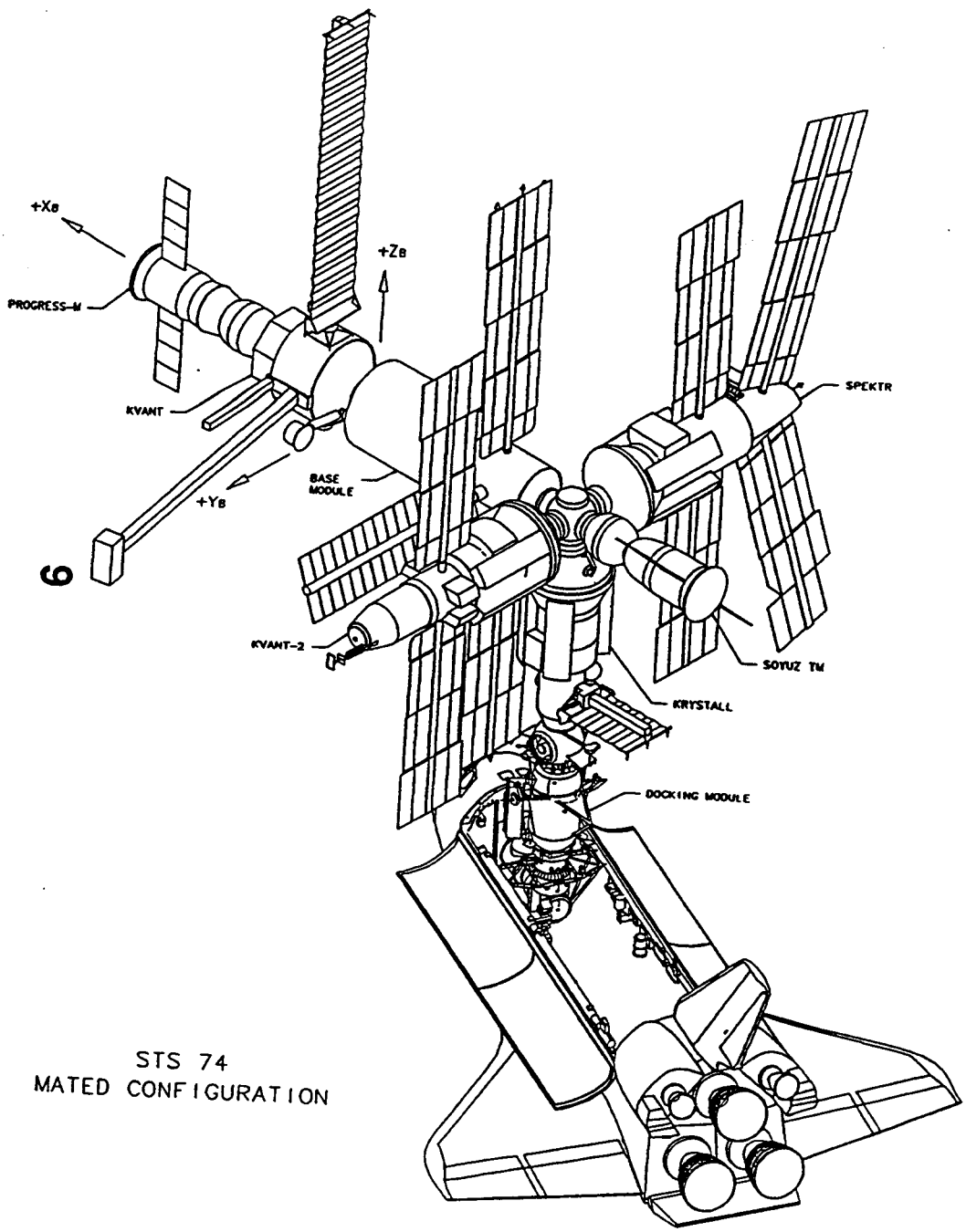
At a distance of about 30 feet from docking, Cameron will stationkeep momentarily to adjust the docking mechanism alignment if necessary. From that point on, the crew will use ship-to-ship communications with Mir constantly to inform the station crew of the Shuttle's status and keep them informed of major events, including confirmation of contact, capture and conclusion of damping. Damping, the halt of any relative motion between the spacecraft after docking, is performed by springs and motors within the docking device.

Due to the length of the docking module, the elbow camera on the mechanical arm will provide the only direct view for Atlantis' astronauts of the docking mechanism's operation during the final docking sequence.

Undocking, Separation and Mir Fly-Around

Once Atlantis is ready to undock from Mir, the initial separation will be performed by springs that will slightly push the Shuttle away from the docking mechanism. Both the Mir and Atlantis will be in a mode called "free drift" during the undocking, a mode that has the steering jets of each spacecraft shut off to avoid any inadvertent firings.

Once the docking mechanism's springs have pushed Atlantis away to a distance of about two feet from Mir -- when the docking devices will be clear of one another -- Cameron will turn Atlantis' steering jets back on. Immediately thereafter, he will slightly fire the Shuttle's jets in the Low-Z mode to begin moving very slowly away from Mir. Atlantis will continue away from Mir to a distance of about 400 feet, where Halsell will begin a flyaround of the station. At that distance, Atlantis will circle Mir twice, the crew performing a photographic survey of Mir, before firing its jets again to depart the vicinity of the station.



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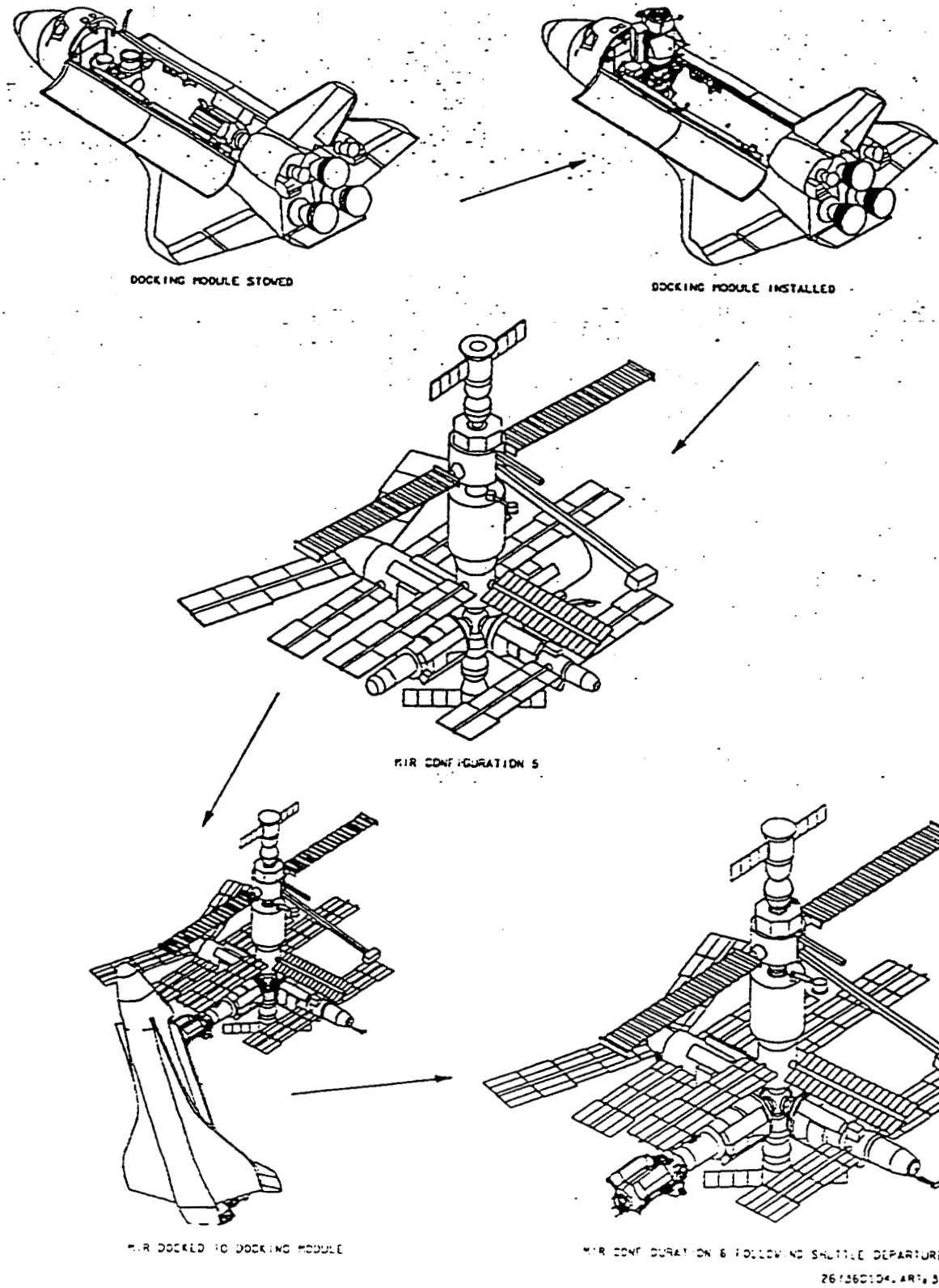
STS 74
MATED CONFIGURATION



DM mission summary

ORBITER DOCKING SYSTEM

The Russian-built Docking Module (DM), to be carried aloft by Atlantis and left attached to the Kristall module of the Mir Space Station, is designed to allow Shuttle-Mir dockings with the Kristall module located at the Mir radial port.

Without the DM, Kristall would have to be moved to the longitudinal axis of Mir to provide clearance for each Shuttle docking. The longitudinal axis location is undesirable for Kristall because the longitudinal port is normally a location for Progress resupply modules and Soyuz spacecraft. In addition, it is not desirable to continually move the Kristall from port to port in preparation for a Shuttle docking.

The 15.4-foot long DM will allow clearance for the Shuttle to dock with Kristall located at the radial axis of Mir. The module will not be moved from that location once STS-74 is complete. All further Shuttle dockings will take place using the DM. It may also be used for future Soyuz dockings.

Docking Module Structure

The DM is mounted in Atlantis' aft cargo bay and held in place by four latches, three on the sides, and one keel latch. A Remotely Operated Electrical Umbilical (ROEU) supplies Shuttle power to the module while it is mounted horizontally in the cargo bay. The ROEU is released before the module is unberthed from the bay and mounted in position for the Mir docking. Power to the DM is not supplied during Atlantis' launch, but will be turned on after reaching orbit.

The DM is 15.4 feet long from tip to tip of the identical Androgynous Peripheral Docking Systems (APDS) located on either end. For identification purposes, APDS-1 is the system that will be attached to Kristall and APDS 2 will be attached to Atlantis. The DM diameter is 7.2 feet, and the module weighs approximately 9,011 pounds.

The DM is constructed of aluminum alloy covered on the exterior by Screen Vacuum Thermal Insulation (SVTI) and a micrometeoroid shield over the body of the module. A truss structure is attached to the module to provide latching to the Shuttle while horizontal in the cargo bay, and the truss will remain attached to the module after the cargo bay latches are released and the DM is unberthed.

On the exterior of the module, two Mir solar array containers are attached to transport solar arrays to the Mir. The solar array containers are attached on either side of the top of the module as it will be situated while in the cargo bay of Atlantis. The solar arrays will be removed from the containers and attached to the Mir during a spacewalk by the Mir cosmonauts after STS-74.

The two solar arrays are different types. One is called the Cooperative Solar Array (CSA) and was built as a cooperative effort between NASA and Russia. The other is a Russian Solar Array (RSA). The Cooperative Solar Array uses Russian structures and NASA photovoltaic modules and was designed as part of the Phase 1 operations of the international Space Station Program. The array is expected to provide greater power and

longer life expectancy over existing arrays and will help to power U.S. experiments aboard the Mir.

A grapple fixture also is attached to the topside exterior of the DM for use with the Shuttle's mechanical arm to unberth the DM from the cargo bay. Also attached to the exterior are several extravehicular activity (EVA) handholds for use during spacewalks.

An external camera is mounted to the DM for use as a backup during docking on STS-74 if an interior centerline camera fails.

Docking Module Avionics Subsystem

The DM's Avionics System is connected to Atlantis to receive power and telemetry by the ROEU while in the cargo bay and by the docking system when attached to the Orbiter Docking System in preparation for Mir docking.

The module is pressurized at all times during ascent and unberthing from the cargo bay, and telemetry information is provided to Atlantis on pressure, temperatures, fan operations and information on the APDS. Commanding also can be performed via the avionics system of the APDS mechanisms, valves, fans, closed circuit television and other equipment.

Power supply, commanding and telemetry for the DM will be switched from Atlantis to Mir after Atlantis has docked. However, Atlantis retains a backup commanding capability for the DM and APDS mechanisms.

Docking Module Thermal Subsystem

The thermal control of the DM is performed by passive thermal blankets on the exterior, a fluid cooling loop and fans for avionics equipment and the APDS window.

The APDS window fan mounts near the bracket that will hold an interior centerline camera and prevents the window from fogging during docking operations.

Docking Module History

Concept discussions for the DM began with RSC Energia in November 1993, and were finalized in June 1994.

Assembly of the DM flight unit began in February 1995 and final assembly and functional testing was completed in May 1995. The DM arrived at KSC in June 1995 in preparation for STS-74.

SHUTTLE-MIR SCIENCE

STS-74 SCIENCE OVERVIEW

STS-74 marks the second of seven planned missions to dock an American Space Shuttle with Russia's Mir space station. During three days of joint operations, astronauts and cosmonauts will transfer the American biomedical and microgravity science samples and data collected by the Mir 18, Mir 19, and Mir 20 resident crews, from the space station to the Shuttle. After return to Earth, the information will be analyzed by researchers on the ground. Included in the items being returned are some samples from an ongoing European Space Agency mission -- continuing the international cooperation in space that will carry on into the future.

Crew members also will transfer hardware and supplies to Mir for future biomedical and environmental investigations. Data and samples gathered from those investigations will be retrieved during future Shuttle/Mir missions. All materials gathered during STS-74, and other planned missions, will provide important information in the design, development, and operation of future space stations.

Water, food, and science instruments will be transferred to Mir for resupply and to support experiments to be conducted on board the space station by the resident Mir 20 crew and the following Mir 21 crew in early 1996. American astronaut Shannon Lucid is then scheduled to launch on the Shuttle (STS-76) in March 1996, and join the Mir 21 crew to continue these investigations that will focus on life sciences, microgravity science, space science, Earth science and technology.

Phase 1 of the International Space Station (ISS) Program, which includes the seven Shuttle missions to Mir and the long duration missions of five American astronauts onboard the Mir, will perform over 75 science and research investigations, most of them during the long duration missions on board the Mir. Four investigations -- Mir Source & Reclaimed Waters; Shuttle/Mir Alignment Stability Experiment; Mir Wireless Network Experiment; Mir Audible Noise Measurement -- will be conducted during the docked phase of STS-74. A protein crystal growth experiment delivered by STS-71 in July also will be recovered and replaced with another unit that will continue this line of research.

Water samples collected from Mir will be returned to Earth for analysis to help determine its purity. The Mir Source and Reclaimed Waters investigations will provide researchers with information to be used in designing, developing, and evaluating water purification units for the ISS. Samples of Mir's potable, reclaimed hygiene water, unprocessed hygiene water, and humidity condensate all will be analyzed postflight to determine their chemical and microbiological characteristics.

The Shuttle/Mir Alignment Stability Experiment will use guidance and control information from both the Shuttle and the Mir station to understand the dynamics of the docked configuration of these two spacecraft. Together, the combined mass of over 200 tons is the largest spacecraft ever flown in space. The stability of this mass under the combined forces of gravity, rocket firings, and gyrodyne operation will allow engineers to certify their models for the control of ISS.

Two other investigations also support space station habitability disciplines. The Mir Audible Noise Measurement and Mir Wireless Network Experiment both have applications for use on the international Space Station.

Astronauts will take measurements that will allow researchers to characterize Mir's acoustic environment. Using a sound level meter, tape recorder and headphones, noise measurements will be gathered at various locations on the space station, including the exercise area, work station, and habitation module. Postflight analysis will help ISS designers determine if additional acoustic mitigation efforts might be required in specific areas of the space station.

The Mir Wireless Network Experiment is a test of a computer communications network which uses radio waves to pass information between unconnected devices. It is planned for use on the international Space Station. A notebook computer will be used to monitor file transfer rates at various locations on the space station.

The Protein Crystal Growth - Dewar experiment launched on STS-71 will be swapped out with a new Dewar by the STS-74 crew. The sample crystals have been growing passively without crew attention since being left on the Mir space station in July. New frozen samples on board Atlantis will be transferred to an undisturbed spot on Mir where they will thaw naturally. As the crystals thaw, diffusion and crystal growth begin. Upon return to Earth, these crystals will be studied and compared to those grown on Earth and over shorter periods during previous Shuttle missions.

The Greenhouse Integrated Plant Experiment began with the Mir 19 crew and was continued by the resident Mir 20 crew. The studies, which are expected to be complete prior to the arrival of Atlantis, are designed to study how plants grow in microgravity and determine how space flight affects plant reproduction, metabolism and productivity. This investigation will provide data that could validate the use of oxygen-generating plants in an advanced life support system for future space stations.

Earth Sciences
Visual Earth Observations

Experiment Description:

The Earth's surface is changing dramatically everyday, but due to our limited view, these phenomenal events cannot be observed or recorded on a large scale. With space flight and long term habitation in a space station, there is a platform available for continual observations from low-Earth orbit. Sites are selected to document geologic structures using variable Sun angles, seasonal events such as biomass burning, longer-term changes like the rise and fall of lake levels, gradual changes in land-use patterns, dynamic patterns in the ocean surface waters, and globally distributed episodic events like tropical storms, floods, forest fires, volcanic eruptions and dust storms.

Experiment Objectives:

To monitor observable Earth surface changes and image ephemeral events (hurricanes, plankton blooms, volcanic eruptions) to incorporate into a 30+ year database of human observations.

Mission Assignments:

STS-74
Mir 21

Researchers:

Dr. K. Lulla of the NASA Johnson Space Center
Dr. C. Evans of the Lockheed-Martin Corporation
Dr. L. Desinov of the Russian Academy of Sciences

Fundamental Biology
Greenhouse

Experiment Description:

Plants can be grown in microgravity and can be used effectively in life support systems. The goal of this investigation is to study plant growth in microgravity and determine the effects of space flight on the ontogenesis, reproductive function, metabolism, and productivity in higher plants.

The Greenhouse experiment is conducted in the Russian/Slovakian-developed plant growth facility called the "Svet." The U.S. has added new lighting and watering systems to enhance plant growth conditions. In addition, the U.S. has added an instrumentation system to the Svet to gather information on how microgravity affects the gas exchange process in plants. Plant development is monitored by daily observations and photographs taken by crewmembers. Plant samples are collected at six specific developmental stages and at final harvesting. All samples are returned to Earth for postflight analysis.

Experiment Objectives:

To investigate the effects of microgravity on the productivity of a crop plant, specifically dwarf wheat.
To identify the chemical, biochemical, and structural changes in plant tissues induced by microgravity.
To determine microgravity's effect on plant processes such as photosynthesis and water use.
To evaluate current facilities for plant growth aboard the Mir.

Mission Assignments:

Mir 18
Mir 19
STS-74 (return items and experiment resupply)

Mir 20
Mir 21

Researchers:

Dr. F. Salisbury of the Utah State University
Dr. M. Levinskikh of the Russian Institute of Biomedical Problems

Human Life Sciences
Analysis of Volatile Organic Compounds

Experiment Description:

This experiment will attempt to characterize the volatile organic compounds (VOCs) in air samples collected on the Mir during the NASA/Mir program. Samples will be collected onto special cartridges using the U.S. Solid Sorbent Air Sampler (SSAS). Also, grab samples will be collected using U.S. Grab Sample Containers. Samples will then be transferred from Mir to the Shuttle and, when back on Earth, to a laboratory at NASA Ames Research Center for analysis. The results of the analyses will reveal detailed information on the types and concentrations of VOCs in the Mir environment. The results also will have a number of uses for advanced life support research, including the demonstration of new technology for air quality monitoring, support of toxicological evaluations of the Mir environment, and support of correlation studies to link the presence of particular VOCs with certain materials, human presence, and biological experiments.

Experiment Objectives:

To provide instrumental resources and analytical expertise for the characterization of volatile organic compounds (VOCs) in the atmosphere and support of environmental science research on the Mir station.

To characterize VOCs on the Mir station through sampling and analysis.
To demonstrate new technology for on-line, real-time monitoring of trace levels of VOCs.
To document the types and concentrations of VOCs on the Mir station and analysis of the results in collaboration with other science investigators.

Mission Assignments:

STS-74 (up items for Mir 21)
Mir 21

Researchers:

Dr. P. Palmer of San Francisco State University
Dr. V. Savina of the Russian Institute for Biomedical Problems

Human Life Sciences
Collecting Mir Source and Reclaimed Waters

Experiment Description:

In this investigation, the water on the Mir space station will be analyzed in detail to study the effectiveness of the Mir purification system. Potable water, water used to maintain hygiene, and water that accumulates from humidity condensate will be analyzed to confirm that any potentially harmful contaminants are maintained at acceptably safe levels. The information gathered by this research will support the development and evaluation of water purification units, water quality standards, and in-flight water sampling hardware for the international Space Station.

Experiment Objectives:

To characterize the chemical purity of Mir water.
To support the design and operation of water purification and monitoring units and the establishment of water quality standards for the international Space Station.

Mission Assignments:

Mir 20
STS-74 (return items and experiment resupply)
Mir 21

Researchers:

Dr. R. Sauer of the Johnson Space Center
Dr. Y. Sinyak of the Russian Institute of Biomedical Problems

Human Life Sciences
Eye/Head Coordination During Target Acquisition

Experiment Description:

The eyes work in conjunction with the vestibular (balance system) in the inner ear, as well as with the other senses, to allow a person to track visual targets while the head and body are moving. Prolonged stays in microgravity change the way the brain responds to eye and head movements when attempting to follow an object with the eyes. This research will quantify these disruptions, continue to allow us to understand limitations, and help devise countermeasures.

All testing of the crewmembers occurs before and after flight. Eye movements are measured by placing electrodes above and below the crewmembers' eyes to measure eye movements. A sensor on the head measures angular head movements. The crewmember is asked to visually fixate on stationary targets or track a moving target by moving only the eyes, only the head, or both eyes and head. These eye-head coordination tests are designed to study the effects of space flight on eye movement

mechanisms controlled by the visuo-motor and vestibular systems, specifically how these systems function separately and how they work together.

Experiment Objectives:

To determine how exposure to microgravity affects the ability of the eyes to follow a target, the reflex movement of the eyes during head movements, and the coordination between eye and head movements while visually tracking an object.

Mission Assignments:

Mir 18
Mir 19
STS-74 (return items)

Researchers:

Dr. J. Bloomberg of the NASA Johnson Space Center
Dr. I. Kozlovskaya of the Russian Institute of Biomedical Problems

Human Life Sciences
Humoral Immunity

Experiment Description:

The human immune system is comprised of two components, the humoral and cell-mediated immunity. Humoral immunity involves the production and action of antibodies, and cell-mediated immunity involves sensitized lymphocytes. Humoral immunity occurs within minutes or hours of exposure to an antigen.

Cell-mediated immunity, on the other hand, is a delayed reaction occurring days after initial exposure; a good example is a positive reaction seen in the skin 24 to 48 hours after a tuberculosis test injection.

Researchers hypothesize that the humoral component of immunity is depressed during space flight, and that antibody production is significantly reduced. Research of this nature is important to establish and protect the health of the crew during space flight, and also leads to a greater understanding of the human immune system.

In this investigation, baseline blood and saliva samples are collected. Crew members then receive immunizations (injections of certain antigens), and blood and saliva samples are taken at timed intervals after the injections are given. Antibodies will be made in response to the injections, and the amounts of antibodies produced are measured in the blood and saliva samples. Data from all the blood and saliva samples should provide researchers with the effectiveness, extent, and time course of the antibody response.

Experiment Objectives:

To investigate the humoral component of the immune system to determine if its function is compromised by the microgravity environment.
To investigate whether antibodies are produced in response to antigen introduction by vaccination and the time course of the response after exposure to microgravity.

Mission Assignments:

Mir 18
Mir 19
STS-74 (return items)

Researchers:

Dr. C. Sams of the NASA Johnson Space Center
Dr. I. Konstantinova of the Russian Institute of Biomedical Problems

Human Life Sciences
Inflight Radiation Measurements

Experiment Description:

The United States and Russia have different methods of detecting and calculating radiation exposures to their crews and spacecraft. This experiment calls for each country's researchers to obtain radiation information in their usual manner. Comparison of the techniques used by the U.S. and Russia for radiation calculations and dosimetry calibrations will enable both countries to validate their radiation detection procedures and identify any differences that exist within their respective protocols. The radiation measurements that occur during this investigation allow scientists to gather additional information about two radiation sources -- galactic cosmic rays and protons trapped by the Earth's magnetic field.

Both crews will wear passive dosimeters (one American and one Russian device) during the Mir missions to measure the radiation to which they are exposed. The crews also will place several American and Russian radiation monitoring devices throughout the Mir space station and the Shuttle.

Experiment Objectives:

To correlate space radiation measurements made by NASA with those made by the Russian Institute of Biomedical Problems.
To compare the NASA and Institute of Biomedical Problems space flight dosimeter calibration techniques.

Mission Assignments:

Mir 18
Mir 19
STS-74 (return items)

Researchers:

Dr. G. Badhwar of the NASA Johnson Space Center
Dr. V. Petrov of the Russian Institute of Biomedical Problems

Human Life Sciences
Magnetic Resonance Imaging

Experiment Description:

When muscles are not used regularly, they begin to deteriorate and weaken, an effect called atrophy. Measurements on the crew of the Spacelab-Japan mission (STS-47) showed that there was significant muscle atrophy after only eight days in weightlessness. Bed-rest studies have documented the degree of expected atrophy after several months of muscle disuse. This investigation will document the degree of muscle weakening during long-duration space flight following a stay on the Mir space station. Measurements will be made before and after flight using Magnetic Resonance Imaging (MRI).

The spine, or backbone, supports the body against gravity. During upright activity on Earth, the downward pull of gravity actually compresses the spine and the spinal discs. When it is not in use, such as when a person is lying down while sleeping, the spine expands. Weightlessness also results in expansion of the spine, which causes the astronauts to become taller and is believed to cause back pain and discomfort. This investigation also will study the relationship between spinal expansion and back pain in astronauts.

Experiment Objectives:

To measure and analyze the bone marrow of the spine, and the muscle volumes of the calf, thigh, back, and neck before and after space flight.
To compare the results from actual long duration stays in weightlessness to data from bed rest studies with and without exercise.
To measure the size of the intervertebral discs before and after long duration space flight to determine if spinal discs remain expanded or enlarged beyond their normal size, after return to Earth's gravity.
To document the occurrence of back discomfort during and after flight and study its association with expansion of the spinal discs caused by space flight.

Mission Assignments:

STS-74 (up items for Mir 21)
Mir 21

Researchers:

Dr. A. LeBlanc of the NASA Johnson Space Center
Dr. I. Kozlovskaya of the Russian Institute for Biomedical Problems

Human Life Sciences
Microbial Investigations

Experiment Description:

Microbes are an integral part of our surroundings and they thrive everywhere on Earth. Researchers are interested to learn which microbes inhabit the Mir space station, if the microbes are affected in any way by the lack of gravity, and if concentrations of microbes differ on the Mir compared to on Earth. Before the Mir 18, STS-71, and Mir 19 flights, researchers developed a profile of the bacteria and fungi that each crewmember might introduce into the space environment. The crewmembers are sampled again after these flights to detect any changes in their microbial populations. Air, water, and surface samples are collected during the flights to monitor changes in the microbial ecology as the mission proceeds. All samples are returned to Earth for analysis by researchers.

Experiment Objectives:

To characterize the microbial profile of each crewmember and the environment of the Mir.
To investigate any changes associated with the microbe physiology or characteristics of the space environment.

Mission Assignments:

Mir 18
Mir 20
STS-74 (return items)

Researchers:

Dr. D. Pierson and R. Sauer of the NASA Johnson Space Center
Drs. N. Novokova, A. Viktorov, and V. Skuratov of the Russian Institute of Biomedical Problems

Human Life Sciences
Protein Metabolism

Experiment Description:

The human body responds to stressful situations in many ways. One response is an increase in protein metabolism. During Shuttle flights, studies have shown that the whole body protein synthesis rate increases dramatically. This experiment uses the 15N-glycine

method, which involves ingesting glycine labeled with a stable isotope of nitrogen, collecting urine samples, measuring body weight, and maintaining dietary logs throughout the experimental period.

Experiment Objectives:

To determine the duration of the metabolic stress response associated with space flight.
To determine how long it takes for protein metabolism to return to the preflight state after a long duration mission.

Mission Assignments:

STS-74 (up items for Mir 21)
Mir 21

Researchers:

Dr. P. Stein of the University of Medicine and Dentistry of New Jersey
Dr. I. Larina of the Russian Institute of Biomedical Problems

Human Life Sciences
Posture and Locomotion

Experiment Description:

Gravity is used as a frame of reference for our sensory-motor response. When gravity is absent, such as during space flight, the sensory-motor system is disrupted. These disturbances are compensated for by the brain, and ultimately the human body adapts to them. After returning to Earth, a readjustment period occurs in which balance and locomotion functions are temporarily disturbed until the brain once again learns to use gravity as a frame of reference. This investigation examines these sensory-motor changes and adjustments. The results should assist researchers in devising countermeasures to reduce the time of adjustment.

This experiment has three parts. The Posture Study will occur before, during, and after the Mir missions. Crewmembers will wear shoes with inflatable bladders to provide pressure to their feet, which simulates one aspect of gravity. They will then do arm raises, both with and without the shoes, while electromyograms are recorded. Researchers will test whether the crewmembers had a muscle response anticipating the arm movement while wearing the shoes.

The second part is the Equilibrium Study, which occurs before and after the Mir missions. This part of the experiment is performed with a specially designed platform capable of modifying sensations from the visual and vestibular (inner ear) systems, and from nerves in the joints.

The third part, the Locomotion Study, is also conducted before and after the Mir missions. For this, crewmembers will walk and run on a treadmill while their movements are videotaped to record changes in their biomechanics.

Experiment Objectives:

The objective of the Posture Study is to investigate the effects of space flight on the role of foot pressure in triggering muscle responses in anticipation of performing balancing body movements (in this experiment, arm raises). The objective of the Equilibrium Study is to quantify the loss of balance control that crewmembers often experience following space flight. The objective of the Locomotion Study is to characterize the effects of space flight on eye, head, and body movements, and muscle activation patterns during walking and running.

Mission Assignments:

Mir 18
Mir 20
STS-74 (return items)

Researchers:

Drs. J. Bloomberg, W. Paloski, D. Harm, M. Reschke, C. Layne and V. McDonald of the NASA Johnson Space Center
Drs. I. Kozlovskaya, I. Tchekirda, M. Borisov, A. Voronov, T. Sirota, and A. Ivanov of the Russian Institute of Biomedical Problems

Human Life Sciences
Renal Stone Risk Analysis

Experiment Description:

It has been suggested that space flight increases the risk of kidney (renal) stone formation, and that the risk is greater during long-duration space flight. This risk is assessed using methods similar to those used on Earth; urine samples are collected over time and analyzed. The concentrations of electrolytes and minerals present in the urine indicate the risk of renal stone formation. Factors contributing to renal stone formation include the urinary concentrations of citrate, oxalate, sulfate, potassium, sodium, calcium, magnesium, phosphate, uric acid, urinary pH, and total urine volume.

In this investigation urine samples are collected and analyzed before, during, and after flight. Measurements of the components mentioned above are made and compared to determine if an increased risk for stone formation occurs during space flight. It is expected that the in-flight samples will provide direct evidence of the effects of microgravity on the risk of renal stone development. These data are necessary to implement possible countermeasures to prevent renal stone development on future long-duration missions.

Experiment Objectives:

To determine the in-flight risk of renal stone formation during extended stays in microgravity.

Mission Assignments:

Mir 18
STS-74 (up items for Mir 21)
Mir 21

Researchers:

Dr. P. Whitson of the NASA Johnson Space Center
Dr. G. Arzamozov of the Russian Institute of Biomedical Problems
Dr. A. S. Kreavoy of the Aviation Hospital in Moscow, Russia

Human Life Sciences
Trace Chemical Contamination

Experiment Description:

The atmosphere and the water supply on the Mir space station are closely related due to the closed environment. Trace chemicals that contaminate the air and water on Mir are removed by several methods. Researchers are interested in characterizing the effectiveness of these methods. The knowledge gained from this investigation will provide additional information about the relationship of the air and water on spacecraft and will assist scientists and engineers in developing improved water and air purification units for future space stations. For this experiment, samples are taken at different intervals during the Mir missions, and during STS-74. Researchers will use these samples to determine levels of carbon monoxide, methane, hydrogen, and low molecular weight hydrocarbons. Levels of formaldehyde in the atmosphere are determined by monitors worn by the crewmembers, while other organic compounds are detected by a piece of hardware called the Solid Sorbent Air Sampler (SSAS), which concentrates volatile organic materials from the air. Potable water samples are also taken at several intervals in flight.

Experiment Objectives:

To study the characteristics of the Mir atmosphere, representing years of a partially-closed air revitalization operation.
To explore the changes in Mir's atmosphere that occur over a 12-week testing interval.
To characterize the chemical purity of Mir potable water.
To provide an in-flight demonstration of hardware currently being developed to collect water samples on the international Space Station.
To develop a better understanding of the interaction between atmospheric and water contaminants.

Mission Assignments:

Mir 18
Mir 19
Mir 20
STS-74 (return items)

Researchers:

Dr. John James and R. Sauer of the NASA Johnson Space Center
Drs. L. Mukhamedieva, V. Savina, and Y. Sinyak of the Russian Institute of Biomedical Problems

Human Life Sciences
Viral Reactivation

Experiment Description:

Once a person is infected with a virus, it may be present in the body for the remainder of that person's life and can be reactivated by several factors, including stress. Researchers do not fully understand what factors cause a latent virus to reactivate, but they believe that environmental stress can stimulate reactivation. One example of this viral reactivation is when a person gets a cold sore during a period when they are under stress.

This investigation's goal is to determine if the stresses associated with space flight cause viral reactivation in crewmembers. Blood samples are collected from the crewmembers before and after the flight. Using a technique called Enzyme Linked Immunosorbent Assay (ELISA), the samples are analyzed to determine viral antibody titers to several types of viruses. In addition, saliva samples are collected before, during, and after the flight and are analyzed by polymerase chain reaction to determine a viral pattern for each crewmember. If crewmembers exhibit symptoms of viral reactivation, additional samples will be collected.

Experiment Objectives:

To determine if the stresses associated with long term exposure to microgravity cause an increased incidence of viral reactivation.

Mission Assignments:

Mir 18
Mir 19
STS-74 (return items)

Researchers:

Dr. D. Pierson of the NASA Johnson Space Center
Dr. I. Konstantinova of the Russian Institute of Biomedical Problems

International Space Station Risk Mitigation
Mir Audible Noise Measurements

Experiment Description:

Besides weightlessness, there are many stress factors that bombard astronauts and cosmonauts inhabiting long duration vehicles. With increased stress levels, stress sensitivity increases. One of the goals of the ISS discipline is to minimize the environmental stress factors as much as possible. This experiment measures the acoustical signatures in the exercise area, workstations, and habitation modules within the Mir space station. Questionnaires are also filled out by the crew to ensure thoroughness. With this information, protective steps can be implemented and sound dampening measures incorporated into the international Space Station.

Experiment Objectives:

To ensure the Mir environment does not exceed the acoustic emission requirements.
To account for where acoustic mitigation may be required to assure crew protection.

Mission Assignments:

Mir 20
STS-74

Researchers:

C. Parsons of the NASA Johnson Space Center

International Space Station Risk Mitigation
Mir Wireless Network Experiments

Experiment Description:

This experiment tests a wireless network system in the Mir environment as a possible network for remote microgravity sensors that are to be used on the international Space Station. The network monitor program measures performance and consists of three mobile computer nodes: a wireless network server, a subnotebook computer, and a Personal Digital Assistant.

Experiment Objectives:

To evaluate the function of this system as part of remote communications for the international Space Station.

Mission Assignments:

Mir 20
STS-74

Researchers:

Y. Gawdiak of the NASA Ames Research Center

International Space Station Risk Mitigation Shuttle/Mir Alignment Stability

Experiment Description:

Star tracker systems and inertial measurement units are integral to the navigation systems of both the Mir and the Shuttle. The Shuttle/Mir Alignment Stability Experiment entails multiple three-hour data collection periods during the docked phase when navigational-dependent events occur (i.e. thruster firings, IMU alignments, or inertial attitude hold). These data will be used to determine the stability of, and sources of any instability between, the Shuttle and Mir navigation systems while the two vehicles are docked. Characterization of Shuttle/Mir relative alignment stability will enable mission planners to determine the feasibility of transferring attitude data between Shuttle and Mir, or Shuttle and the international Space Station.

Experiment Objectives:

To characterize the Shuttle/Mir docked configuration and relative alignment stability.

Mission Assignments:

Mir 20
STS-74

Researchers:

R. Yates of the NASA Johnson Space Center
Dr. S. Shitov, NPO Energia

Microgravity Protein Crystal Growth Dewar

Experiment Description:

Growing crystals in microgravity can provide significant advantages over processes used on Earth. Development of crystals in space is of interest to researchers because the crystals grown are more pure and generally more free of defects than those that crystallize in our gravitational environment on Earth.

Before a Mir docking Shuttle flight, frozen solutions from which the crystals will grow are loaded into the Dewar, launched on the Shuttle, and then transferred to the Mir after Shuttle docking. Once onboard the Mir, the samples slowly thaw and the crystallization process is initiated. Crystals are grown aboard Mir using several different methods of growth, and the samples are returned to Earth for analysis. The Space Acceleration Measurement System (SAMS) unit is used to monitor any vibration in the vicinity of the crystal experiment.

Experiment Objectives:

To obtain crystals of sufficient size and purity that their quality and other crystallographic properties may be evaluated and compared with corresponding crystals grown on Earth.
To evaluate the effectiveness of crystal growing techniques used in long-duration space flight.
To compare crystals grown using the in-flight methods to crystals grown using the methods typically used on Earth.

Mission Assignments:

Mir 18
Mir 19
Mir 20
STS-74 (return items and experiment resupply)
Mir 21

Researchers:

Drs. A. McPherson and S. Koszelak of the University of California, Riverside
Dr. A. Mitichkin of Russia's NPO Energia Microgravity Space Acceleration Measurement System

Space Acceleration Measurement System

Experiment Description:

Materials science experiments require a very stable environment to yield the best results. Thruster firings and movements of the crewmembers cause random vibrations and accelerations which can affect an experiment, possibly compromising the results. The Space Acceleration Measurement System (SAMS) records these fluctuations in the microgravity environment so that researchers can apply this information when interpreting the results of an investigation. By characterizing the acceleration environment of the space vehicle, researchers can learn where regions of high acceleration forces exist, avoiding those areas for experiment placement.

Experiment Objectives:

To measure and record low-level perturbations to the microgravity environment at or near the experiment hardware.

Mission Assignments:

Mir 18
Mir 19
Mir 20
STS-74 (return items and experiment resupply)

Mir 21

Researchers:

Dr. R. DeLombard of the NASA Lewis Research Center
Dr. S. Ryaboukha of the Russian Institute of Biomedical Problems

IMAX CARGO BAY CAMERA (ICBC)

During the STS-74 mission, the crew will use an IMAX Cargo Bay Camera to document Atlantis' rendezvous and docking with the Mir station. After the mission, selected still images from the film will be made available to the public via the internet. Sections of the film will be transferred to videotape and will be broadcast on NASA-TV.

NASA is using the IMAX film medium to document its space activities and better illustrate them for the public. This system, developed by IMAX Systems, Corp., Toronto, Canada, uses specially designed motion picture cameras and projectors to record and display high definition, large screen pictures.

NASA has flown IMAX camera systems on many Shuttle missions, including the recent STS-63 Shuttle-Mir rendezvous and STS-71 Shuttle-Mir docking. Film from previous missions was used to create the productions, The Dream is Alive, The Blue Planet, and Destiny in Space.

The IMAX Cargo Bay Camera is a space-qualified, 65 mm color motion picture camera system consisting of a camera, lens assembly, and a film supply magazine containing approximately 3500 feet of film and an empty take-up magazine. The camera is housed in an insulated, pressurized enclosure with a movable lens window cover. The optical center line of the 30 mm camera lens is fixed and points directly out of the payload bay along the Orbiter Z axis with a 23 degree rotation towards the Orbiter nose. Heaters and thermal blankets provide proper thermal conditioning for the camera electronics, camera window and film magazines.

The 65 mm film will be transferred to 70 mm motion picture film and will be included in a future large-format feature film about the cooperative program with the Russians. An audio tape recorder with microphones will be used in the crew compartment to record middeck audio sounds and crew comments during camera operations. The audio sound is then transferred to audio tapes or compact discs for playing in coordination with the motion picture.

The camera system is operated by the crew from the Aft Flight Deck with the enhanced Get Away Special Autonomous Payload Controller (GAPC). Commands such as on/off, camera standby, and camera run/stop may be initiated by the crew. Additional commands for camera setups such as f/stop, focus, and frame rate status of exposed film footage also are accomplished by the crew using the GAPC. A light level measurement unit will be used by the crew to set the lens aperture. Seven aperture settings and a fixed focus zone are available for this flight.

The normal camera speed is 24 frames per second (fps). On this flight, this also can be changed to 6 fps for photographing slower moving objects. The 3500 feet of film in the ICBC will last approximately 10.5 minutes at 24 fps and much longer at 6 fps. Film cannot be changed in flight and ICBC operations are terminated when all film is exposed. ICBC is managed by Dick Walter of the Johnson Space Center.

GLOW-4 PASDE PAYLOAD (GPP)

The GPP payload consists of two experiments, the GLO-4 experiment and the PASDE experiment. The payload is managed by Goddard Space Flight Center's Special Payloads Division.

The GLO-4 will study the Earth's thermosphere, ionosphere and mesosphere energetics and dynamics using broadband spectroscopy. GLO-4 also will study spacecraft interactions with the atmosphere by observing Shuttle and Mir glow, Shuttle engine firings, water dumps and fuel cell purges.

Three Photogrammetric Appendage Structural Dynamics Experiment (PASDE) cannisters, located throughout the cargo bay, will photogrammetrically record structural response data of the Mir solar arrays during the docked phase of the mission. These data will be analyzed on the ground to verify the use of photogrammetric techniques to characterize the structural dynamics of the array thus demonstrating that this technology can result in cost and risk reduction for the ISSA on-orbit structural verification.

Shuttle Glo Experiment (GLO-4)

This experiment originated as the "Shuttle Glow" experiment sponsored by the USAF/Phillips Laboratory. It is also referred to as the Arizona Airglow Experiment. The nature of the instrument makes it ideal for studies of Earth's thermosphere. Consequently, it has become a joint program with NASA's Space Physics Division of the Office of Space Science.

Scientists continue to investigate the mysterious shroud of luminosity, called the "glow phenomenon," observed by astronauts on past Shuttle missions. Theory suggests that the glow may be due to atmospheric gases on the windward or ram side surface of the Space Shuttle colliding and interacting with gaseous engine effluents and contaminate outgassing molecules. The glow intensity is weak, decreases with altitude and requires some special conditions for good detection -- both the Sun and Moon must be below the horizon, for example, so the spatial extent of the glow will be mapped precisely (0.1 degrees). The effects of ambient magnetic field, orbit altitude, mission elapsed time, Shuttle thruster firings, and surface composition on the intensity and spectrum of the glow also will be measured. An optical emission model will then be developed from the data.

The GLO experiment consists of imagers and spectrographs, which are boresighted to the imagers, so that both sensors are focused onto the same area of observations, e.g., the Shuttle tail. Imagers serve to unambiguously identify the source region of the glow spectrum as well as to map the spatial extent of the luminosity. Unique features of the sensors are their high spectral and spatial resolution. Each spectrograph employs a concave holographic grating that focuses and disperses light within a small field of view (0.1 by 8.5 degrees) over the wavelength range 115-1100 nanometers. The sensor is comprised of nine separate channels, each of which operates simultaneously and independently, to cover individual segments of the spectrum.

The Shuttle glow experiments are short compared to the total flight time of the mission; therefore, the remainder of the flight is dedicated to studies of Earth's atmosphere. The

scientific objectives are related to the Ionosphere, Thermosphere and Mesosphere section of the NASA Space Physics Division. The NASA investigations using the GLO experiment are designed to measure the effects of solar extreme ultraviolet radiation on the Earth's atmosphere. The measurements will record temperature and temperature gradients and pressures of the major constituents of the atmosphere in order to validate global models.

Active participants who have ground-based instrumentation try to make observations throughout the campaign. The data are correlated and deposited in a data bank at the National Center for Atmospheric Research, Boulder, CO, for use by the community. The coordination of these data is important to relate local observation to the global picture provided by the GLO observations from the Shuttle.

The manager for the GLO program is Dr. David J. Knecht of Phillips Laboratory, Dr. Edmond Murad from the Phillips Laboratory and Dr. A. Lyle Broadfoot from the University of Arizona are co-principal investigators on GLO.

Photogrammetric Appendage Structural Dynamics Experiment (PASDE)

The Photogrammetric Appendage Structural Dynamics Experiment (PASDE) is an experiment to mitigate technical risk and cost associated with passive, on-orbit, measurement of spacecraft appendages for the international Space Station (ISS) program. The experiment will demonstrate a photogrammetric method for making appendage structural measurements, provide engineering data on solar array designs expected to be used on the ISS, and verify that routine on-orbit spacecraft operations provide sufficient excitation for structural response testing.

On-orbit measurements of spacecraft structural response are often desired or necessary for structural verification and loads prediction. Typically, acceleration response time-history data are collected and processed on the ground. From these data, structural dynamic characteristics (structural mode frequencies, damping, and mode shapes) can be determined.

The use of photogrammetric measurements is a low cost alternative to dedicated accelerometer-based structural response measurement systems, especially when measurements are required for articulating or rotating spacecraft components such as solar arrays or thermal radiators. Elimination of accelerometers, wiring, signal conditioning and digital conversion electronics, etc., can greatly simplify the spacecraft electrical design and integration, with corresponding reduction in spacecraft cost.

For the international Space Station, on-orbit structural response measurements are required for loads validation and verification of structural mathematical models. Currently, accelerometer-based measurements of the US. primary truss and modules are being planned, however, accelerometer measurement of the US. solar arrays is not being considered because of cost and resource impacts. Since the current ISS design calls for numerous video cameras mounted at various external points, photogrammetric measurements of solar array structural responses may be a potential alternative.

The PASDE experiment will verify that photogrammetric measurements can provide measurement resolution and accuracy sufficient for ISS structural verification purposes. It is manifested as part of the ISS Phase I Risk Mitigation Program. ISS Phase I involves seven flights of the U. S. Space Shuttle to the orbiting Russian Space Agency Mir space station. Current plans call for PASDE to fly twice as part of the Phase I program.

The NASA Langley Research Center is funded by NASA Headquarters Code X for development and first flight of PASDE. PASDE hardware will be flown as a Class D, NASA Goddard Space Flight Center (GSFC) Hitchhiker payload. On STS-74, the second Space Shuttle flight to Mir, PASDE will fly along with the GLO-4 experiment as the Hitchhiker GLO-4/PASDE or GPP payload. For this flight, PASDE will obtain data from a solar array attached to the Kvant-II module of Mir. On STS-86, the seventh mission of Shuttle to Mir, PASDE hardware will again be used to obtain structural measurements as part of the Phase-I Risk Mitigation Program.

SHUTTLE AMATEUR RADIO EXPERIMENT-II (SAREX-II)

Students in the U.S. will have a chance to speak via amateur radio with astronauts aboard the Space Shuttle Atlantis during STS-74. Ground-based amateur radio operators ("hams") will be able to contact the Shuttle astronauts through a direct voice ham radio link as time permits.

Shuttle Commander Ken Cameron (call sign KB5AWP) and mission specialists Jerry Ross (N5SCW), William McArthur (KC5ACR), Chris Hadfield (license pending) and Jim Halsell (license pending) will talk to students in five schools in the United States using "ham radio."

Students in the following schools will have the opportunity to talk directly to orbiting astronauts for approximately four to eight minutes:

* Franklin Jr. H.S., Pocatello, ID
* Connecticut-area schools (combined project)
  - Staples High School, Westport (contact site)
  - Western Middle School, Greenwich
  - Saxe Middle School, New Canaan
  - Columbus Magnet School, Norwalk
* Lake Street Elementary School, Crown Point, IN
* Magee Middle School, Round Lake Heights, IL
* Quimby Oak Jr. High School, San Jose, CA

The radio contacts are part of the SAREX project, a joint effort by NASA, the American Radio Relay League (ARRL), and the Radio Amateur Satellite Corporation (AMSAT).

The project, which has flown on 19 previous Shuttle missions since 1983, is designed to encourage public participation in the space program and support educational initiatives by demonstrating the effectiveness of communications between the Shuttle and low-cost ground stations using amateur radio voice and digital techniques.

STS-74 SAREX Frequencies

IMPORTANT NOTE Since the flight is a Shuttle-Mir docking mission, and SAREX and Mir amateur radio stations usually share the same downlink frequency (145.55), the SAREX Working Group has decided to make the following SAREX frequency changes for the STS-74 mission:

SAREX transmissions from the Space Shuttle may be monitored on a worldwide downlink frequency of 145.84MHz.

The voice uplink frequencies are:
144.45, 144.47 MHz

The crew will use separate receive and transmit frequencies. *Please do not transmit on the Shuttle's Downlink frequency.* The downlink is your receiving frequency. The uplink is your transmitting frequency.

Note: The astronauts will not favor any one of the above frequencies. Therefore, the ability to talk to an astronaut depends on selecting one of the above frequencies chosen by the astronaut.

Additional Information for Amateur Radio Operators

Several audio and digital communication services have been developed to disseminate Shuttle and SAREX-specific information during the flight. The ARRL ham radio station (W1AW) will include SAREX information in its regular voice and teletype bulletins.

The amateur radio station at the Goddard Space Flight Center, (WA3NAN), will operate around the clock during the mission, providing SAREX information, retransmitting live Shuttle air-to-ground audio, and retransmitting many SAREX school group contacts.

Shuttle Tracking

Information about orbital elements, contact times, frequencies and crew operating schedules will be available during the mission. Current Keplerian elements to track the Shuttle are available from the following sources:

- NASA Spacelink computer information system
  BBS: (205) 895-0028
  Internet, Telnet, FTP, Gopher: spacelink.msfc.nasa.gov
  WWW: http://spacelink.msfc.nasa.gov
- NASA SAREX WWW Home Page:
http//www.nasa.gov/sarex/sarex_mainpage.html
- American Radio Relay League
  Telephone: (860) 594-0301
  BBS: (860) 594-0306
  W1AW news bulletings ("FOR FURTHER INFORMATION")
  WWW: http://www.arrl.org
- AMSAT
  WWW: http://www.amsat.org
- NASA Johnson Space Center Amateur Radio Club
  BBS: (713) 244-5625
- Goddard Amateur Radio Club
  BBS: (301) 286-4137
  WWW: http://garc.gsfc.nasa.gov/www/garc-home-page.html
  Packet: WA3NAN on 145.090 MHz in D.C. area

The Goddard Space Flight Center amateur radio club planned HF operating frequencies:

3.860 MHz	7.185 MHz
14.295	21.395
28.650	

STS-74 CREW BIOGRAPHIES

Kenneth Cameron (Col., USMC), 45, is Atlantis' Commander for the STS-74 mission. This is Cameron's third flight.

Selected as an astronaut in 1984, Cameron served as the Pilot on the STS-37 mission in 1991, which featured the deployment of the Compton Gamma Ray Observatory and a pair of spacewalks, one of which advanced techniques for Space Station construction. Cameron then commanded the ATLAS-2 mission in 1993 which studied atmospheric and solar activity.

Cameron, whose hometown is Cleveland, OH, received a bachelor of science degree in aeronautics and astronautics from MIT in 1978 and a masters degree in aeronautics and astronautics from MIT in 1979. He enlisted in the Marine Corps in 1969, ultimately becoming an infantry platoon commander in Vietnam. Cameron served in a variety of roles as a test pilot, project officer and aviation instructor, earning special honors which include the Defense Superior Service Medal, the Distinguished Flying Cross and the Marine Corps Association Leadership Sword.

Most recently, Cameron served as the first NASA Director of Operations at the Gagarin Cosmonaut Training Center in Star City, Russia, where he worked with Russian training personnel and officials in setting up a support system for astronaut training and operations for the Phase I program.

Cameron has logged over 3400 hours of flying time in 47 different types of aircraft.

James Halsell (Lt. Col., USAF), 39, is Atlantis' Pilot for the STS-74 mission. Halsell is making his second flight into space in as many years.

Halsell, whose hometown is West Monroe, LA, graduated from the U.S. Air Force Academy in 1978 with honors in engineering and aeronautics and was assigned to Nellis Air Force Base, NV, where he served as an aircraft commander qualified in conventional and nuclear weapons delivery. After tours of duty as a test pilot and fighter pilot, Halsell became a test pilot at Edwards Air Force Base, CA, where he performed test flights with the F-4, F-16 and SR-71 aircraft.

Halsell was selected as an astronaut in 1990 and served as part of the Astronaut Support Personnel team at the Kennedy Space Center which prepares Space Shuttle vehicles for flight. Halsell also worked as a spacecraft communicator (CAPCOM) in Mission Control for several flights.

Halsell served as the Pilot on the STS-65 mission in 1994 in which seven astronauts spent 15 days conducting more than 80 microgravity research experiments in a Spacelab module in Columbia's cargo bay.

Chris Hadfield (Major, Canadian Air Force), 36, is Mission Specialist 1 (MS 1) for Atlantis' flight. This is Hadfield's first mission.

Hadfield, from Sarnia, Ontario, Canada, graduated from the Royal Military College in Kingston, Ontario, Canada with a bachelor's degree in mechanical engineering with honors and earned a master's degree in aviation systems from the University of Tennessee after conducting post-graduate research at the University of Waterloo in Ontario, Canada.

In the 1970s, Hadfield taught skiing and ski racing for the better part of ten years and was an Air Cadet, flying both gliders and powered aircraft. Hadfield joined the Canadian Armed Forces in 1978, ultimately flying CF-18 "intercept" fighters for the North American Aerospace Command (NORAD). Hadfield attended test pilot school at Edwards Air Force Base, CA, testing F/A-18 and A-7 aircraft and served as an exchange officer with the U.S. Navy at Patuxent River Naval Air Station, MD. Hadfield was selected as one of four Canadian astronauts in 1992.

Hadfield's assignments with NASA have included technical and safety issues, Shuttle glass cockpit development and launch support at the Kennedy Space Center.

Jerry Ross (Col., USAF), 47, is Mission Specialist 2 (MS 2) for Atlantis' flight. This is Ross' fifth space flight.

Ross first flew in 1985 on STS-61B in which three communications satellites were deployed. Ross also conducted two spacewalks to test Space Station construction techniques. Ross' second flight occurred on STS-27 in 1988, a dedicated mission for the Department of Defense. Ross flew again on STS-37 in 1991, in which the Compton Gamma Ray Observatory was deployed. On that flight, Ross performed two more spacewalks to help free a stuck antenna on the GRO and to test Space Station assembly hardware. Ross' last flight took place in 1993 on STS-55, in which he served as Payload Commander for the German-sponsored D-2 Spacelab mission.

Ross, from Crown Point, IN, graduated from Purdue University with bachelor of science and master's degrees in mechanical engineering in 1970 and 1972 before entering active duty with the Air Force. Ross graduated from the USAF Test Pilot School's Flight Test Engineer Course in 1976 and was assigned to duties at Edwards Air Force Base, CA. Ross served as the chief flight test engineer for the B-1 and performed mission planning for the B-1 offensive avionics test aircraft.

In February 1979, Ross was assigned to the Johnson Space Center as a payloads officer before being selected as an astronaut in 1980. His technical assignments have included work with extravehicular activity issues and the remote manipulator system, and he has worked as a spacecraft communicator (CAPCOM) in Mission Control and as Chief of the Mission Support Branch.

William McArthur (Lt. Col., USAF), 44, is Mission Specialist 3 (MS 3) for Atlantis' flight. McArthur is flying in space for the second time.

McArthur, whose hometown is Wakulla, NC, graduated from West Point with a bachelor of science degree in applied science and engineering in 1973 and a master's degree in aerospace engineering from Georgia Tech in 1983.

McArthur served in a tour with the U.S. Army in Fort Bragg, NC, before entering Army Aviation School in 1975. He was the top graduate of his flight class and was designated an Army aviator in 1976. He subsequently served in Korea before becoming a company commander, platoon leader and operations officer in Savannah, GA. In June 1987, McArthur graduated from the U.S. Naval Test Pilot School and was designated an experimental test pilot. McArthur is a Master Army Aviator.

He was assigned to the Johnson Space Center in 1987 as a Shuttle vehicle integration test engineer. McArthur served as a member of the Emergency Escape and Rescue Working Group before becoming an astronaut in 1990. McArthur has served in a number of capacities, including work as a technical adviser to the solid rocket booster and redesigned solid rocket motor projects and as a spacecraft communicator (CAPCOM) in Mission Control.

McArthur's first flight came in 1993 as a mission specialist on STS-58, a dedicated Space Life Sciences mission in which dozens of experiments were conducted to test the human body's adaptability to the microgravity environment.

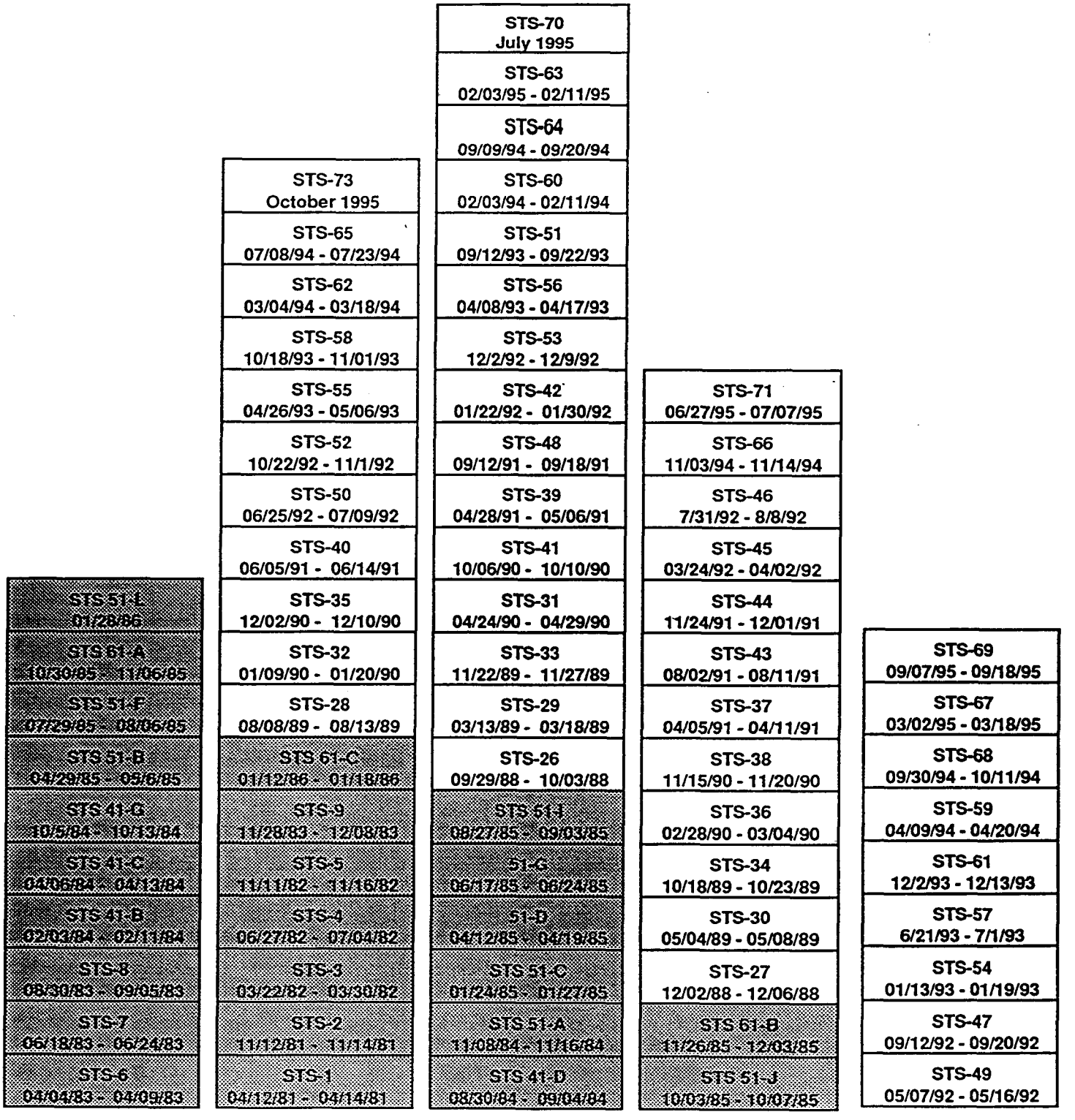
UPCOMING SHUTTLE MISSIONS

MISSION	ORBITER	MAJOR PAYLOADS	TARGET DATE	MISSION DURATION
STS-74	ATLANTIS	Shuttle-Mir Mission-2	NOVEMBER 1995	8 Days
STS-72	ENDEAVOUR	Space Flyer Unit-Retrieval OAST-FLYER	JANUARY 1996	9 Days
STS-75	COLUMBIA	Tethered Satellite System United States Microgravity Payload-3	FEBRUARY 1996	14+2 Days
STS-76	ATLANTIS	Shuttle-Mir Mission-3	APRIL 1996	10+1 Days
STS-77	ENDEAVOUR	SPACEHAB-4 SPARTAN-207	MAY 1996	9 Days
STS-78	COLUMBIA	LMS	JULY 1996	14+2 Days
STS-79	ATLANTIS	Shuttle-Mir Mission-4	AUGUST 1996	9+1 Days
STS-80	COLUMBIA	ORFEUS-SPAS WSF	NOVEMBER 1996	16 Days
STS-81	ATLANTIS	Shuttle-Mir Mission-5	DECEMBER 1996	9+1 Days

Based on February 1995 Manifest

SHUTTLE FLIGHTS AS OF OCTOBER 1995

72 TOTAL FLIGHTS OF THE SHUTTLE SYSTEM – 47 SINCE RETURN TO FLIGHT



News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

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October 26, 1995

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RELEASE: 95-193

GALILEO ON TRACK AFTER TAPE RECORDER RECOVERY

NASA's Galileo spacecraft is proceeding toward its December rendezvous with Jupiter, with spacecraft engineers greatly relieved at last weekend's test results showing that its onboard tape recorder remains functional.

On Tuesday, Oct. 24, a revised spacecraft command sequence radioed to Galileo began issuing instructions ordering the spacecraft to resume regular readouts of data from the memories of several science instruments. The spacecraft also returned to normal housekeeping duties, executing scheduled engineering operations such as flushing of rocket thrusters.

The new command sequence replaced the one ground controllers stopped after the Oct. 11 tape recorder problem, in which the data tape recorder failed to cease rewinding after recording an image of Jupiter.

The tape recorder had remained in a standby mode until Friday, Oct. 20, when it was tested and proved still operational. Detailed study of engineering data from the spacecraft indicates that the tape recorder can be unreliable under some operating conditions, project officials said. However, the problem appears to be manageable, and should not jeopardize return of the nearly 2,000 images of Jupiter and its moons that are to be stored on the recorder for playback over the course of Galileo's two-year tour in orbit around the planet.

Tuesday's work on the spacecraft included commands for the tape recorder to wind 25 extra times around a section of tape possibly weakened when the recorder was stuck in rewind mode with the tape immobilized for about 15 hours. Due to uncertainty about its condition, spacecraft engineers have declared that this portion near the end of the tape reel is "off-limits" for future data recording. The extra tape wound over it secures that area of tape, eliminating any stresses that could tear the tape at this potential weak spot. Unfortunately, the approach image of Jupiter that Galileo took Oct. 11 is stored on the portion of tape that is now unavailable, and it will not be played back.

-more-

With only weeks to go before Galileo's Dec. 7 arrival at Jupiter, project engineers are busy analyzing the tape recorder's condition to fully understand its capabilities and weaknesses. "We need to be sure we fully understand the system that we have now," said Galileo Project Manager William J. O'Neil.

The tape recorder is a key link in techniques developed to compensate for the loss of use of Galileo's high-gain antenna, which is stuck in a partially open position. Data must now be sent at a much lower data rate through Galileo's low-gain antenna. The tape recorder is to be used to store information, particularly imaging data, until it can be compressed and edited by spacecraft computers and radioed back to Earth.

Since the tape recorder incident, Galileo project officials have decided to not take pictures of Io and Europa on the day the spacecraft arrives at Jupiter. Instead, they will devote the tape recorder that day to gathering data from Galileo's Jupiter atmospheric probe as the cone-shaped probe descends into the giant planet's swirling atmosphere over the course of its 75-minute mission. During that time, the probe will collect the first-ever direct measurements of the chemical makeup and weather of the solar system's largest planet.

"Our priorities are clear," said O'Neil. "We have to get all the probe data." Other flybys of the Jovian moons, including frequent "volcano watch" monitoring of Io, occur throughout the mission, giving ample opportunity to collect data on all the moons. Late in the mission, O'Neil said, a close flyby of Io might be made to make up for the Io flyby data that will be sacrificed on Dec. 7.

-end-

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

David Drachlis/Michael Braukus
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0034)

For Release

October 27, 1995
ATTN: ASSIGNMENT DESK

INTERVIEWS AVAILABLE ON SPACE SHUTTLE MISSION

Scientists gathered at NASA's Marshall Space Flight Center's Payload Operations Control Center, Huntsville, AL, are available for live or taped interviews via the NASA Television system to discuss work on experiments being conducted during the 16-day Space Shuttle Columbia mission currently underway. B-Roll of the mission and experiments also can be provided for each interview.

Scientists are working around the clock on two shifts on experiments on this second United States Microgravity Lab (USML-2) mission. Experiments range from the role of gravity in combustion to how gravity affects the formation of semi-conductor crystals. Other experiments focus on the study of biotechnology, which can be applied to the development of drugs for diseases and the growth of food crops.

USML-2 also will direct its research to a new television monitoring system. This new television technology will provide researchers on the ground with up to six channels of video transmitted simultaneously from orbit. Previously only one channel was available for video monitoring of science experiments in space. Ground to air television also is being employed for the first time on this mission. This system will serve remaining Spacelab missions and be a part of the international Space Station.

NASA Television is located on Spacenet 2, Transponder 5, Channel 9 at 69 degrees West longitude. The transponder frequency is 3880 Mhz and the audio subcarrier is 6.8 Mhz. Polarization is horizontal.

-end-

News Release

National Aeronautics and
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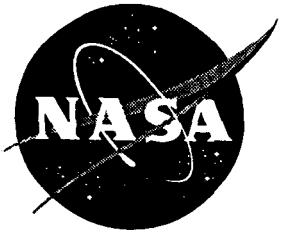

For Release

October 27, 1995

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NOTE TO EDITORS: N95-72

RADARSAT/DELTA II ROCKET SCHEDULED FOR NOV. 3 LAUNCH

The launch of the RADARSAT spacecraft is scheduled to occur between 6:22 to 6:23 a.m. PST on Friday, Nov. 3, from NASA's Space Launch Complex 2, Vandenberg Air Force Base, CA.

The spacecraft, mated aboard a McDonnell Douglas-built Delta II rocket on Oct. 25, is a cooperative program between the Canadian Space Agency (CSA), the National Oceanic and Atmospheric Administration (NOAA) and NASA.

Carrying a powerful radar that can see through clouds and darkness, RADARSAT will produce high resolution images of the Earth's lands and oceans. Data from satellite images will be used for research and applications in oceanography, agriculture, forestry, hydrology and geology. Information on sea ice and terrestrial ice sheets will be used for climate studies and as an aid for navigation of Arctic and Antarctic Ocean waters, including iceberg surveillance.

The CSA developed and will operate the satellite; NASA will furnish launch services. In exchange, the United States will have access to archived data and direct approximately 15 percent of the satellite's observing time. NOAA will use the data for environmental monitoring programs and also facilitate data distribution to other U.S. government agencies. RADARSAT International, Inc. (RSI) will be the commercial distributor of the data worldwide. Lockheed Martin, as a partner in RSI, has distribution rights in the U.S.

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A prelaunch news conference will be held on Thursday, Nov. 2 at 11 a.m. PST in the main conference room of the NASA Vandenberg Resident Office, Building 840, Vandenberg AFB, CA.

Participants will be:

Floyd Currington, NASA Launch Manager, Kennedy Space Center
Don Miller, NASA Launch Vehicle Manager, Goddard Space Flight Center
Robert Warren, RADARSAT Spacecraft Manager, Canadian Space Agency
Capt. John Shattuck, USAF Launch Weather Officer, Vandenberg AFB

NASA Television is carried on Spacenet 2, transponder 5, channel 9 located at 69 degrees West longitude. Audio only will be available on the V-3 circuit which may be reached by dialing 407/867-1260.

-end-

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News Release

National Aeronautics and
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Washington, DC 20546
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For Release

October 27, 1995

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RELEASE: 95-194

HISTORIC NASA WIND TUNNEL IS RETIRED

NASA's oldest operating wind tunnel, which has tested everything from biplanes to a Mercury space capsule to far-out airplanes of the future, is being retired.

Located at NASA Langley Research Center, Hampton, VA, it was declared a National Historic Landmark in 1985. The unique facility had been modified several times over its 64 years to keep up with the growing size of aircraft and with improvements in test techniques. Its work will be done in other NASA wind tunnels.

The cavernous wind tunnel was completed in 1931 to test the aerodynamic characteristics of full-scale models and actual airplanes at operational flight speeds. It was originally called the "Full Scale Tunnel."

Full scale testing eliminated the uncertainties of model testing and provided basic information prior to and during flight testing. Contemporary studies in the renamed 30- by 60-Foot Tunnel often focused on stability and control characteristics for military aircraft, and high-lift capability for both civil and military aircraft.

Throughout its history, the tunnel has been used for the testing of innumerable aircraft configurations. It was the largest wind tunnel in the world until 1945.

The tunnel has contributed to military, commercial and general aviation aircraft designs. Its many contributions include fundamental aerodynamic testing of full-scale aircraft during the 1930s; drag reduction or "clean up" studies of full-scale military aircraft during World War II; free-flight testing of models of vertical takeoff and landing aircraft; testing of the Albacore, the fastest submarine in the world in 1950; testing of the nation's first spacecraft, the Mercury space capsule; testing of full-scale general aviation aircraft; and testing of lifting body, supersonic transport and present-day military aircraft configurations.

-more-

Designs for the tunnel were begun in 1929, with $900,000 of funding appropriated before the Depression. Because the Tunnel was designed and built during the Depression, the design team, led by Smith J. DeFrance, was able to take advantage of inexpensive materials and a large pool of unemployed engineers. Construction began in the spring of 1930 and the completed 30- by 60-Foot Tunnel was dedicated on May 27, 1931.

The overall tunnel is 434 feet long and 222 feet wide with a maximum height of 97 feet. The actual test section is an open-jet 30 feet high, 60 feet wide and 56 feet long. Two four-bladed wooden propellers, each 35.5 feet in diameter and powered by a 4,000-horsepower motor, generate the air stream. The tunnel is a closed-loop design, with two return passages that allow for continuous air flow at speeds up to 120 mph.

Over the years the test section of the tunnel has been modified several times to adapt to changing needs. During renovations in the 1960s and 1970s, the tunnel was equipped for free-flight dynamic model testing. In recent years, the tunnel was extensively used for such free-flight tests. This test technique, unique to this facility, involved flying 10- to 20-percent scaled models controlled by remotely-positioned pilots.

The future of the Tunnel is uncertain, but there are no plans to tear it down or to change its external appearance. Possible adaptive uses are under study and certain components may be made available to the National Air and Space Museum or other museums. Langley is a federal custodian of historic properties, in conformance with the provisions of the National Historic Preservation Act.

-end-

News Release

National Aeronautics and
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For Release
October 27, 1995

RELEASE: 95-195

REVOLUTIONARY NEW MINIATURE SENSOR SYSTEM DEVELOPED

A team led by NASA researchers has devised a miniaturized sensor system that could be a catalyst for a revolutionary new generation of small, low-cost spacecraft to explore the solar system.

The Planetary Integrated Camera-Spectrometer, or PICS, is expected eventually to replace whole suites of individual spacecraft instruments that, on some NASA missions, can weigh more than 400 pounds and take up as much room as a four-drawer filing cabinet. Literally smaller than a breadbox, PICS combines some of the most productive and often-used space sensors into an 11-pound package.

Its development represents a crucial step toward enabling future NASA missions that will have to use smaller launch vehicles and, hence, smaller spacecraft to travel to distant planets and other bodies in the solar system.

In addition to being much smaller, the PICS system offers high performance and improved instrument sensitivity over previous spacecraft instruments of the same type at lower overall cost, according to PICS Program Manager Gregg Vane of NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA. "Many people assume that low cost implies low capability," he said, "but PICS proves you can have very high capability at low cost."

The PICS prototype, developed through a collaboration between researchers at JPL, industry, universities and the U.S. Geological Survey, recently completed successful science and engineering tests that qualify the instrument system for development as flight hardware. PICS is a candidate for flight on several future planetary spacecraft missions.

-more-

PICS is one of the first successful efforts to squeeze down multiple instrument optics, functions and electronics into a small, efficient unit that requires dramatically less power and mass than was previously achieved. It brings together in one integrated sensor system an ultraviolet imaging spectrometer, an infrared imaging spectrometer and two visible-light cameras -- instruments that can characterize the chemical makeup, thermal properties, weather, atmospheric physics and geophysics of bodies in the solar system.

In the past, each of these spacecraft instruments has been built with its own separate, dedicated optical system and electronics. In PICS, the instruments share common telescope optics and extremely low-power, miniaturized instrument electronics. The result is one highly-capable integrated instrument system that requires less than five watts of power and is so small it can be tucked under an arm. In comparison, similar instruments on the Voyager spacecraft required 75 watts to operate four large, entirely separate optical sensors, in addition to a sophisticated pointable scan platform for aiming.

"PICS will be able to achieve Voyager-class science at 10 cents on the dollar," said geologist Dr. Larry Soderblom of the U.S. Geological Survey in Flagstaff, AZ. "PICS will allow the science return we are accustomed to from our flagship missions like Voyager, but at the cost of a Discovery mission -- about 1/10th to 1/20th of the cost."

PICS' initial development was triggered by a challenge from designers of NASA's Pluto Express mission, a proposed exploration of the only known planet in the solar system that still awaits close reconnaissance by a spacecraft. The Pluto mission's requirements called for an instrument incorporating two spectrometers -- one far ultraviolet and one infrared -- in addition to two visible-light cameras, all weighing in at less than about 15 pounds. Space instrument specialists say no previously existing instrument met these constraints or even came close to matching those specifications.

From the outset, the PICS team's approach was to simplify the system and to minimize the mass and power of the instruments by maximizing the extent to which components can be shared. To further reduce mass and power consumption, PICS was designed to eliminate items such as focusing mechanisms and filter wheels found on traditional spacecraft imaging systems.

Another critical innovation in the PICS design was the decision to construct all the optical and structural components of silicon carbide. The material is inexpensive, highly dimensionally stable, chemically non-reactive and possesses excellent structural capabilities and manufacturability, according to Vane.

Beyond the innovations in materials and miniaturization that made PICS work is a new management approach calling for concurrent engineering and science planning.

"This contrasts with the more traditional approach taken in past missions where the scientists defined the requirements and the engineers developed the design, often with little interaction between the two groups," Vane said. Individual instruments were developed in this way, independent of each other and delivered to the spacecraft engineers as a fait accompli, he said. "We've reengineered the process of how to design a sensor system. Simply working together as an integrated team of scientists and engineers from the start has made the difference."

"With PICS instrument technology now in hand, JPL mission planners can reasonably conceive of missions to any planet in the solar system with a Delta or similar launch vehicle," said Dr. Patricia Beauchamp, PICS instrument manager. One concept on the drawing board would send a PICS-equipped spacecraft beyond Pluto to the so-called Kuiper Belt of comets. Another would put a spacecraft in orbit around Neptune's moon, Triton.

Fully prototyped and tested, PICS has been designed for ease of manufacture, integration and test. A flight model for a candidate mission could be produced in 18 months. "We're ready to roll," Beauchamp said. "We're just waiting for a ride."

The Planetary Integrated Camera-Spectrometer is being developed at the JPL for the Research Program Management Division of NASA's Office of Space Science, Washington, DC.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release

October 30, 1995

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NOTE TO EDITORS: N95-73

DRAMATIC HUBBLE IMAGES AT NOV. 2 SPACE ASTRONOMY UPDATE

What some scientists are calling 'the most dramatic images yet taken by the Hubble Space Telescope' will be presented at 3 p.m. EST, Thursday, Nov. 2, 1995, in the NASA Headquarters Auditorium, 300 E St. SW, Washington, DC.

The images will be the focus of the next Space Astronomy Update, entitled "Star Birth in the Eagle Nebula." The images will reveal dark pillar-like structures in the Eagle Nebula (also called M16) which are columns of cool interstellar hydrogen gas and dust. The pillars, protruding from the interior wall of a dark cloud like stalagmites from the floor of a cavern, are slowly being eroded away by radiation from nearby stars. This process exposes small globules of even denser gas which had been buried deep inside the clouds. These are incubators for new stars and are called, appropriately enough, "EGGs" (Evaporating Gaseous Globules").

Panelists will be Dr. Jeff Hester, Astronomer in the Dept. of Physics and Astronomy at Arizona State University, Tempe; Dr. Anne Kinney, Project Scientist for Education, Space Telescope Science Institute, Baltimore; and Dr. Bruce Margon, Chairman of the Astronomy Dept., University of Washington, Seattle. Moderator will be Dr. Steve Maran, Senior Staff Scientist, Goddard Space Flight Center, Greenbelt, MD. The SAU will be carried live on NASA Television, with 2-way question-and-answer capability for reporters covering the event from participating NASA Centers.

- end -

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News Release

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Douglas Isbell
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For Release
October 30, 1995

RELEASE: 95-196

SCIENCE INSTRUMENTS SELECTED FOR 1998 MARS MISSIONS

An extremely lightweight camera and a variety of instruments designed to study daily weather patterns and the icy south pole on Mars have been selected by NASA officials to fly aboard an orbiting spacecraft and lander in late 1998.

Known as the Mars Surveyor '98 Orbiter and the Mars Surveyor '98 Lander, the robotic missions will enable detailed scientific studies of the planet's atmosphere, climate, meteorology and surface volatiles such as water ice and frozen carbon dioxide. The lander will be the first mission ever sent to the poles of Mars, where it will settle on terrain that appears to consist of alternating layers of clean and dust-laden ice.

"These investigations will collect data that is fundamental to a better knowledge of the climate of Mars, both in the past and in the present," said Dr. Wesley T. Huntress Jr., Associate Administrator for Space Science at NASA Headquarters. "Landing in a polar region is particularly interesting and exciting. These areas probably hold the key to understanding what appear to be quasi-periodic climate fluctuations on the planet over thousands or even hundreds of thousands of years, and the nature of the orbit of Mars makes this our only opportunity to send a mission to a pole during the next decade."

The orbiter will carry an advanced technology optical camera called the Mars Surveyor '98 Orbiter Color Camera, to be provided by Dr. Michael Malin of Malin Space Science Inc., San Diego. With a total mass of only 2.2 lbs., the camera system is less than 1/20th the mass of the Mars Observer Camera spare, also provided by Malin, that will fly aboard NASA's Mars Global Surveyor spacecraft, scheduled for launch in November 1996.

The camera consists of two elements: a wide-angle camera that will acquire daily weather maps of Mars with a surface resolution of a half mile to up to four and a half miles, and a medium-angle camera with a resolution of 131 feet that will study alterations in the planet's surface over time due to changing atmospheric conditions and winds.

The orbiter also will carry an atmospheric instrument called the Pressure Modulator Infrared Radiometer (PMIRR), which was selected for flight in July. PMIRR will measure temperature profiles of the Martian atmosphere and monitor its water vapor and dust content.

-more-

Malin Space Science Inc., will provide another low-mass camera for the Mars '98 lander, called the Mars Surveyor '98 Descent Imager. It will produce wide-angle views of the Martian surface beginning about 10 seconds after the lander's parachute has been deployed, at approximately five miles in altitude, until its landing. These pictures will be used to provide a larger geographic context for local landforms around the landing zone, and to help tie together images from the orbiter with the exact landing site.

Once on the surface, the lander will power up an integrated science payload to be supplied by Dr. David Paige of the University of California at Los Angeles. Known as the Mars Volatile and Climate Surveyor, this payload achieves a mass of just 37 lbs. through the use of common electronic components and other shared subsystems.

The payload includes a mast-mounted imager to take stereo photos of the surrounding landscape; a six-and-a-half foot robot arm that will dig up and deliver surface samples to a thermal and evolved gas analyzer to determine their content of ice and frozen carbon dioxide; and a mast-mounted meteorological package with sensors to record atmospheric pressure, temperature and winds. During its planned 86-day surface mission, the lander's robot arm will attempt to dig trenches in the icy polar soil and then use a small arm-mounted camera to transmit close-up pictures of any stratified layers.

"Like the exposed walls of the Grand Canyon on Earth, these layers should reveal a fascinating record of gross fluctuations in the Martian environment, telling us more about why a planet that appears to have been so wet in the past is so cold and dry now," said Huntress.

NASA is continuing discussions with the Russian Space Agency (RSA) about the possibility of Russia supplying a science instrument for the lander, in addition to hardware that the RSA is contributing for the PMIRR orbiter instrument. Options for the lander include a laser-ranging device that measures atmospheric dust and haze or an electromagnetic sounder that would map soil density variations and possible subsurface water. A final decision on these lander instruments should be made by the end of November, Huntress said.

The Mars '98 Orbiter and Lander are scheduled for separate launches aboard Med-Lite expendable launch vehicles in December 1998 and January 1999, respectively. The missions are part of NASA's Mars Surveyor program, a 10-year series of cost-capped missions to Mars featuring two launches every 26 months.

-end-

News Release

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For Release

November 1, 1995

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Lori Rachul
Lewis Research Center, Cleveland, OH
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RELEASE: 95-197

TESTS MAY PROVIDE INSIGHT ON SEVERE WEATHER EFFECTS ON AIRCRAFT

NASA's Lewis Research Center, Cleveland, OH, has simulated severe weather conditions in a wind tunnel -- rain, ice and lightning--and the tests may lead to improved flight safety.

Severe weather tests were conducted in the Icing Research Tunnel (IRT) at Lewis for the Joint Program on Improvement of Lightning and Static Protection of Radomes, led by a consortium of government agencies and commercial companies in the U.S. and Europe.

Aircraft nose radomes, the fiberglass shell that forms the housing for radar equipment, are susceptible to damage from lightning strikes because they are constructed from non-electrically conducting materials. Without adequate protection, the radome is vulnerable to being punctured or shattered by a lightning strike, which could damage the weather radar. To minimize the possibility of damage, radomes are usually fitted with an arrangement of solid metal bars, called diverters, that intercept lightning strikes and conduct them safely to the airframe. Although these diverters provide adequate protection, they sometimes interfere with radar performance.

Tests in the IRT were conducted on a newer protection device, called segmented diverters, which are designed not to interfere with radar performance. Simulated lightning tests were conducted to verify the effectiveness of the segmented diverters in rain and/or icing conditions.

This was the first time that lightning tests have been applied to an aircraft component in a wind tunnel in combination with severe weather conditions. The tests in NASA's IRT simulated the typical in-flight environmental conditions that occur at the altitudes and temperatures where most lightning strikes to airplanes have occurred.

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The IRT underwent minor modifications to accommodate a 500 kilovolt (kV) Marx-type lightning generator which was positioned outside the tunnel. The generator produced high voltage impulses reaching a peak amplitude of 500 to 750 kV for times ranging from 1 to 20 microseconds. The voltage test was simulated in the tunnel via a porcelain insulated feed through a bushing installed in the tunnel floor. The simulated lightning strike was applied from an electrode attached to the bushing and positioned adjacent to the radome being tested in the tunnel. Over 80 lightning strikes were applied to radomes typical of the radomes currently in use on general aviation, regional and large transport aircraft.

Prime contractor to the consortium is AEA Technology in the UK. Major subcontractors are DGA/CEAT in Toulouse, France and Lightning Technologies, Inc., in Pittsfield, MA, who provided the lightning simulation equipment for the tunnel tests.

-end-

EDITOR'S NOTE: Images accompanying this release are available to news media representatives by calling the Headquarters Imaging Branch at 202/358-1900. NASA Photo Numbers are:

	Color	**B&W**
Lightning Protection Device	95-HC-642	95-H-655
Transport Radome	95-HC-643	95-H-656

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Internet Advisory

National Aeronautics and
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For Release

November 2, 1995

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RELEASE: I95-15

GALILEO PROBE HOME PAGE NOW ONLINE

The latest information about NASA's Galileo Probe mission and other information about the solar system's largest planet, Jupiter, is now available on the Internet.

Information can be accessed on the World Wide Web at the following URL:

http://ccf.arc.nasa.gov/galileo_probe/

The Galileo Project is a robotic mission to explore Jupiter and its surrounding moons and magnetosphere. The spacecraft, which started its journey Oct. 18, 1989 with the launch of the Space Shuttle Atlantis, consists of an orbiter and an entry probe.

The orbiter and probe successfully separated from each other on July 13, 1995 and will arrive at Jupiter on Dec. 7, along slightly different trajectories. The orbiter will orbit well above the cloud tops of Jupiter and make observations of the Jovian system for 22-months. The probe will descend into Jupiter's atmosphere on Dec. 7 and directly measure the atmosphere of the giant gas planet for the first time.

-end-

News Release

National Aeronautics and
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For Release

November 2, 1995

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RELEASE: 95-198

NASA/FAA TESTING NEW AIR TRAFFIC CONTROL TOOLS AT DENVER AIRPORT

NASA and the Federal Aviation Administration have been field testing a new generation of tools at Denver's International Airport that will reduce delays and air traffic controller workload, and increase fuel efficiency for airplanes.

Called the Descent Advisor (DA), the device is being tested at the airport's air route traffic control center. The DA, a component of a larger effort known as CTAS (for Center-TRACON Automation System), is one of three software tools designed to improve the efficiency of air traffic operations.

"This is a significant milestone in the development of highly-capable decision-support software for air traffic controllers," said Dr. George Donohue, FAA's Associate Administrator for research and acquisitions.

When implemented, CTAS will provide accurate route projections for the efficient sequencing of aircraft as they transition from en route to terminal airspace, identify potential aircraft conflicts and present options for resolving them, and develop a display and interface to the system for controllers. CTAS is under development at the Ames Research Center, Mountain View, CA, in cooperation with the FAA.

The tests of the DA software involve more than 200 commercial flights arriving at Denver under a wide variety of weather, traffic and delay conditions. Tests also include the use of an air/ground datalink system to improve coordination between participating flights and the CTAS system by exchanging key data to improve both systems.

-more-

Tests with both jet transport and turboprop commuter aircraft are being conducted during selected traffic periods of 60-90 minutes duration, two to three times per day, five days per week.

The software assists air traffic controllers by providing them with time and location data for the efficient sequencing and separation of traffic in en route airspace as they near their destination airport. For flights arriving in high density terminal areas such as Denver, the software provides proposed routes for fuel-efficient descents that accurately meet scheduled times of arrival.

As part of CTAS, the software will complement other key technologies, such as datalink and advanced cockpit automation, to deliver maximum benefits to the aircraft operators.

"Preliminary results are very good, with arrival time accuracy routinely within 20 seconds and often within 10. This accuracy was based on the issuance of a single clearance in cruise, nominally 25 miles prior to descent, for a trajectory-descent projection of about 15 minutes," said Steven Green, an Ames aerospace engineer and NASA's Descent Advisor project manager.

Currently, air traffic controllers routinely achieve an arrival time accuracy of about one minute using manual techniques. DA's goal is to reduce arrival time prediction accuracy to 20 seconds or less. This level of accuracy will improve traffic management sequencing and more than double the useful range of computer conflict prediction.

"An exciting thing about the development of CTAS is the early and continuing involvement of the ultimate users of the system - the controllers and the pilots - in the design and evaluation of this complex system," said Dr. Everett Palmer, an Ames researcher and the DA cockpit human factors lead.

Following completion of the tests, a series of air traffic controller simulations will be conducted at Ames in preparation for the next series of field tests scheduled for October 1996.

-end-

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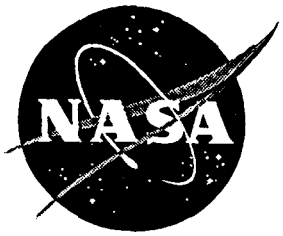

For Release

James Cast
Headquarters, Washington, DC
(Phone: 202/358-1779)

November 3, 1995

RELEASE: 95-199

NASA ANNOUNCES 1994 PHASE II RESEARCH PROPOSAL SELECTIONS

NASA's Office of Space Access and Technology has selected four research proposals for immediate negotiation of a fixed-price contract valued up to $500,000 each with a two-year performance period.

The proposals are for Phase II contracts in NASA's Small Business Technology Transfer (STTR) Pilot Program. A total of seven proposals were submitted by contractors completing Phase I projects. All proposals were peer reviewed for both technical merit and commercial potential. Selections were based on the following factors: scientific and technical merit, results of Phase I, evidence of commercial potential, and capability of the small business concern.

The objective of a Phase I project is to determine the feasibility of the proposed research. Phase II continues the research of the most promising Phase I projects.

The STTR program is similar to the Small Business Innovation Research Program but varies by requiring a small business concern to conduct cooperative research and development by partnering with a research institution. At least 40 percent of the work must be performed by the small business concern, and at least 30 percent of the work must be performed by the research institute.

NASA anticipates the selection of approximately seven additional proposals from those submitted in categories of general aviation software and systems, and small-scale robotics by mid-December 1995.

-more-

SBIR PHASE II AWARDS

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Innovative Aerodynamic Technologies
534-C Wythe Creek Road
Poquoson, VA 23662

Old Dominion University
Dept. of Computer Science
Hampton Blvd.
Norfolk, VA 23529

Quality Information Systems, Inc.
10680 West Pico Blvd, Suite 260
Los Angeles, CA 90064

University of California
at Los Angeles
4732 Boelter Hall
Los Angeles, CA 90024

-end-

NASA press releases and other information are available automatically by sending an Internet electronic mail message to domo@hq.nasa.gov. In the body of the message (not the subject line) users should type the words "subscribe press-release" (no quotes). The system will reply with a confirmation via E-mail of each subscription. A second automatic message will include additional information on the service. Questions should be directed to (202) 358-4043.

News Release

National Aeronautics and
Space Administration
Washington, DC 20546
(202) 358-1600

For Release

Terri Hudkins
Headquarters, Washington, DC
(Phone: 202/358-1977)

November 3, 1995

RELEASE: 95-200

NASA BEGINS SERIES OF LIVE EDUCATION TELECASTS

A live, pre-college educational NASA television broadcast entitled, ***NASA...On the Cutting Edge***, will begin Tues., Nov. 7, featuring students using computers to manipulate robots, examining how the Sun interacts with Earth and our Solar System, exploring the international Space Station, and previewing NASA's future exploration and scientific advancements.

Now in its second season, ***NASA...On the Cutting Edge*** is a series of three, 1-hour, live and interactive education television programs broadcast via satellite to schools in all 50 states, Canada, Mexico and Puerto Rico between 4-5 p.m. Eastern time. Last season, over 2,000 education institutions participated in the series.

The videoconference series updates teachers and students in grades 5-12 with explorations of NASA research in science, mathematics and technology. Registered participants can dialogue with NASA presenters on-air during each program via phone. Post-broadcast interaction is available through Internet conferencing on NASA Spacelink. To register, send an e-mail to:

nasaedutv@smtpgate.osu.hq.nasa.gov

There is no charge to participate but schools must register in advance to receive satellite coordinates, announcements, publications and support materials and instructions on how to obtain an Educator Account on NASA Spacelink. To register, write NASA Teaching From Space, Oklahoma State University, 308 CITD Room A, Stillwater, OK 74078-0422, or call 405/744-6784.

The 1995-96 schedule includes:

Robotics
Tuesday, November 7, 1995
4-5 p.m. Eastern

See how telerobotic and virtual reality systems push the limits of space exploration and how NASA develops specialized robots, which make astronauts time in space safer and more effective. Preview exciting robotic spin-offs in agriculture, health care, and futuristic amusement parks.

-more-

Students in Pasadena, CA, will use local controls to operate an experimental robot in a Mars-like test field at NASA's Jet Propulsion Laboratory and a robot in a neutral buoyancy tank at the Maryland University, College Park, MD. These tests will execute actual courses that will be undertaken in future NASA Mars missions.

International Space Station
Thursday, January 25, 1996
4-5 p.m. Eastern

Find out how this multi-national effort will yield our first permanent steps into the Cosmos and learn why planned experiments need to be conducted in this permanent microgravity environment.

Fire & Life -- The Sun-Earth Connection
Thursday, April 11, 1996
4-5 p.m. Eastern

This program examines how solar orbiters are answering questions like, "What processes drive the Sun's variability?" and, "How does the Sun interact with Earth, the Solar System and the Interstellar Medium?"

The educational broadcast series is produced for NASA by the Teaching From Space Program in conjunction with Oklahoma State University's Educational Television Services and NASA Field Centers.

NASA TV broadcasts on C-band, Spacenet 2, transponder 5, 69 degrees West longitude. NASA TV intends to simulcast live broadcasts when they do not conflict with Shuttle mission programming and scheduled video news feeds. Distance-learning networks and PBS affiliates are encouraged to simulcast the broadcasts.

- end -

NASA press releases and other information are available automatically by sending an Internet electronic mail message to domo@hq.nasa.gov. In the body of the message (not the subject line) users should type the words "subscribe press-release" (no quotes). The system will reply with a confirmation via E-mail of each subscription. A second automatic message will include additional information on the service. Questions should be directed to (202) 358-4043.

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

For Release

November 5, 1995

VIDEO ADVISORY: V95-159

SPACE RADAR IMAGES ON NTV MONDAY

Monday's video news file on NASA TV will air for the first time images from the Space Radar Lab missions that flew aboard the Shuttle last year. The images will show how spaceborne imaging radar systems can be used to better predict future flooding in the United States, see beneath the sands of Africa to find ancient continent collision sites, and create three dimensional maps.

Video News Files are aired each day at noon, 3, 6 and 9 p.m. EST.

ITEM #1: MIDWEST FLOODS **TRT: 1:00**
Spaceborne radar examines the mid-west floods from 1993.

ITEM #2: ANCIENT EARTH **TRT: 1:00**
Space radar looks beneath the sands of the Sahara Desert (3 images)

ITEM #3: LAKE TAHOE TO TELESCOPE PEAK **TRT: 1:00**
Computer generated animation of a simulated flight from Lake Tahoe to Telescope Peak. Radar image is combined with digital elevation data to construct a three-dimensional map of the surface.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

November 6, 1995

VIDEO ADVISORY: V95-160

X-31 CRASH, SURFSAT, UPCOMING SHUTTLE MISSION HIGHLIGHTS

Tuesday's video news file will air for the first time footage of the January 19 crash of an experimental aircraft, the X-31, that occurred at Edwards Air Force Base, CA. A Mishap Investigation Board has concluded that an accumulation of ice on an onboard system caused the aircraft to fail. Video discussing the SURFSat student-built satellite that will be used for deep space communications research and development also will be aired.

NASA TV will air animation and interviews with crewmembers of the upcoming Space Shuttle Atlantis STS-74 mission, due to launch this coming Saturday from the Kennedy Space Center, FL. STS-74 will be the second in a series of docking missions between the American Space Shuttle fleet and the Russian Mir space station. NASA TV will replay images taken from the Space Radar Lab that flew aboard the Space Shuttle last year at the close of the news file. *Video News Files are aired each day at noon, 3, 6 and 9 p.m. EST.*

ITEM #1: X-31 CRASH FOOTAGE
Crash of experimental aircraft from January 19, 1995.
ITEM #2: SURFSat TO HELP DEVELOP AND TEST NEW TRACKING STATIONS
Student-built satellite to help test space communications R&D.
ITEM #3: STS-74 ANIMATION
Animation of second Mir/Space Shuttle docking.
ITEM #4: INTERVIEW -- COMMANDER KENNETH D. CAMERON
ITEM #5: INTERVIEW -- PILOT JAMES D. HALSELL, JR.
ITEM #6: KARAKAX VALLEY
A three-dimensional perspective of a remote valley in Tibet, as seen by spaceborne radar.
ITEM #7: ANCIENT EARTH
Spaceborne radar looks beneath the sands of the Sahara Desert (3 images)
ITEM #8: INTERVIEW -- TOM FARR, SIR-C INVESTIGATOR
Farr explains the impact of topography on geology.
ITEM #9: SUDAN COLLISION ZONE
Radar image of Keraf Suture showing geologic features beneath layers of sand.
ITEM #10: MISSOURI RIVER FLOOD
Spaceborne radar examines the mid-west floods from 1993.
ITEM #11: INTERVIEW -- DIANE EVANS, SIR-C PROJECT SCIENTIST
Evans explains how SIR-C will help predict future flooding.
ITEM #12: REPLAY -- LAKE TAHOE TO TELESCOPE PEAK ANIMATION

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release

Douglas Isbell
Headquarters, Washington, DC
(Phone: 202/358-1753)

November 6, 1995

Mary Hardin
Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

RELEASE: 95-201

FROM ANCIENT EARTH TO MODERN FLOODS, SPACE RADAR FINDINGS OFFER NEW INSIGHTS ON THE CHANGING FACE OF OUR HOME PLANET

Findings from two flights of a spaceborne imaging radar aboard the Space Shuttle have given scientists insights into flooding in the American midwest in 1993, the course of the Nile River, and collisions between ancient supercontinents eons ago.

The findings are being presented this week at the annual meeting of the Geological Society of America in New Orleans. The space radar data were taken by the Spaceborne Imaging Radar C/X-Band Synthetic Aperture Radar (SIR-C/X-SAR) during two flights of the Space Shuttle Endeavour in April and October 1994.

NASA launched its first Earth-observing synthetic aperture radar on Seasat in 1978. Two later versions of the instrument flew on the Space Shuttle in 1981 and 1984, each an improvement on its predecessor. X-SAR is a follow-on to the Microwave Remote Sensing Experiment, a German payload that was flown on the first Shuttle Spacelab mission in 1983.

One of the most astonishing results of the 1981 mission was the discovery of ancient river beds under the sands of the Sahara Desert in North Africa. The 1984 mission enabled explorers to find the Lost City of Ubar in Oman. The Magellan mission to Venus was equipped with an imaging radar that provided the first comprehensive look at the surface of that cloud-shrouded planet.

Following are highlights of the 1994 findings.

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RADAR LOOKS BACK IN TIME AT ANCIENT EARTH

Hundreds of millions of years before the first humans were born, and even millions of years before the dinosaurs reigned, the Earth was dominated by one giant landmass that formed when all of the present-day continents crashed together. Now, scientists using spaceborne radar to look beneath the sands of Africa's Sahara Desert have discovered where these ancient continents collided more than 650 million years ago.

"The formation of this 'supercontinent' resulted in a massive ice age that covered the land with glaciers and set the stage for the evolution of the first complex animals. Finding the location of this collision zone is fundamental to understanding how this ancient supercontinent was formed," said Dr. Robert Stern, a member of the radar team from the University of Texas at Dallas. "This discovery also helps unravel the mystery of what controls the course of the Nile, a question that has perplexed geologists for more than a century."

"These data reveal geologic structures buried beneath the thin skin of desert sands in a manner that is reminiscent of an x-ray's ability to study the inside of a human body," Stern said. "If you're standing on the surface there is little to be seen. The geologic structures we are seeing are obscured by a few inches to a few feet of sand."

The recent discovery beneath the sands of the Sahara has helped scientists look back in time to the era of so-called supercontinents, including an exotic landscape scientists call Greater Gondwana. This landmass formed when fragments of east Gondwana (present-day Australia, Antarctica and India) crashed into west Gondwana (present-day Africa and the continents of North and South America).

"The collision zone between east and west Gondwana is buried beneath the sands of the Sahara Desert and cannot be detected using conventional field work or other types of remote sensing imagery," Stern said. "We knew from the results of the first Shuttle imaging radar experiment in 1981 that spaceborne radar could reveal amazing things beneath the Sahara. A team from the U.S. Geological Survey had discovered ancient rivers buried elsewhere in the Sahara. We thought that we could use the capability of the SIR-C/X-SAR system to penetrate ultra-dry sand and reveal the faults and folds of this collision zone, in a region of northern Sudan called the Keraf Suture. Now that we know where it is, we can move on to studying how and when the collision occurred."

BENEATH THE SANDS, CLUES ON THE COURSE OF THE NILE

The radar data also have revealed the faults and fractures in the rocks that control the course of the Nile River in the northern Sudan.

"In this region, the Nile makes a big lazy 'S', first north, then southwest, then north again," Stern said. "We can see on the radar images the structures that control the northward stretches of the Nile. We're trying to use the radar images to explain why the Nile turns southwest instead of continuing north to the Mediterranean. Understanding what controls the course of the Nile is a critical part of understanding the history of the river that is essential to millions of people in Egypt, Sudan and Ethiopia."

In addition to helping answer questions related to the collision zone and the course of the Nile, Stern said the SIR-C/X-SAR radar data would be invaluable to developing nations in the area and private companies in their searches for oil, gold and water beneath the Sahara Desert.

RADAR DATA REVEAL POTENTIAL FOR FUTURE FLOODING

Scientists investigating the damage caused in the midwestern United States by the so-called "Great Flood of 1993" have developed a new technique -- using these spaceborne and imaging radar systems -- to understand the potential for future flooding and how that might impact neighboring communities.

A team of scientists used data from the spaceborne radar, along with data from two airborne radar systems, to map the Lisbon Bottoms and Jameson Island flood plains of the Missouri River in central Missouri. The flood plain was ravaged by the severe floods of 1993 and, more recently, by floods occurring this year.

The team, led by Dr. Raymond E. Arvidson, chair of Earth and Planetary Sciences at Washington University in St. Louis, analyzed SIR-C/X-SAR data and airborne radar data obtained during two flights of a NASA DC-8 aircraft in the summers of 1994 and 1995.

From this database, the team estimated that the 1993 flood added at least 5 million metric tons of sand to the flood plains study area and eroded about 3 million metric tons of soil.

"These all-weather radar systems are very sensitive to the presence of vegetation and can also be used to acquire very detailed topographical data -- the shape of the flood plain, the presence or absence of levees, the presence or absence of vegetation," Arvidson said. "These parameters are very important for damage inventory. Radar is a natural for flood-monitoring and damage assessment. It is a new way to assess flood damage because monitoring can be done during the flood and damage assessment can be done using post-flood data."

The radar systems are capable of distinguishing between soil moisture and standing bodies of water. Unlike other remote sensing systems, the radar can penetrate a forest canopy and bounce off the water, sending data back to the aircraft or spacecraft. A study of the flooded area over time allowed Arvidson and his group to look at the natural recovery of vegetation as the flood plain returned to normal.

Arvidson and his team hope the information gained from their study will provide new ways for environmentalists to manage wetlands in flood-prone areas, such as the Missouri River flood plain they are currently analyzing.

"The long-term objective is to use this area as a demonstration site for using radar to map wetlands characteristics," Arvidson said. "We're trying to use the information to predict the extent to which these wetlands alleviate flooding downstream, where there are thousands of acres of rich farm land. The management of wetlands requires periodic detailed mapping, and radar systems such as these provide the needed coverage and quantitative information."

SIR-C/X-SAR is a joint mission of the United States, German and Italian space agencies. NASA's Jet Propulsion Laboratory, Pasadena, CA, built and manages the SIR-C portion of the mission and also manages the airborne radar missions for NASA's Office of Mission to Planet Earth, Washington, DC.

-end-

NOTE TO EDITORS: The radar images are available from JPL's public access computer site, via Internet by World Wide Web at the address http://www.jpl.nasa.gov, by anonymous file transfer protocol (ftp) at the address jplinfo.jpl.nasa.gov, or by dialup modem to the telephone number (818) 354-1333.

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

November 6, 1995

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Jim Sahli
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-0697)

RELEASE: 95-202

SPACE DISTURBANCE DETECTED BY NASA SATELLITE BEFORE REACHING EARTH

A NASA spacecraft detected a huge interplanetary disturbance which struck the Earth's protective magnetic field on Oct. 18, producing a magnetic storm and auroral displays, or "Northern Lights" that persisted for two days.

The phenomenon was visible in the United States as far south as Denver, according to scientists at NASA's Goddard Space Flight Center, Greenbelt, MD, who reported critical satellite data to other government agencies and scientists around the world.

The information was relayed electronically to the U.S. Air Force and to the National Oceanic and Atmospheric Administration's Space Environment Laboratory, in Boulder, CO, where evaluators issued an updated "space weather alert" to commercial satellite operators, electrical utilities and other organizations worldwide.

"The rapid response to the Wind observations and the prompt issuance of the alert were made possible by advanced data systems, technology and networks," said Dr. Keith Ogilvie of Goddard, NASA's Project Scientist for Wind. The central processing and distribution systems were developed and implemented by NASA and supported by the Wind science teams, NOAA, the Air Force, and international partners.

The disturbance, called a "giant magnetic cloud," was 65 million miles across and speeding toward the Earth at over 2.1 million miles per hour when it was detected at 3 p.m. EST on Oct. 18 by NASA's Wind spacecraft. Wind is an

-more-

unmanned spacecraft patrolling interplanetary space 662,000 miles from Earth, pointed toward the Sun. Invisible to normal telescopes and to the human eye, the cloud was composed of magnetic fields and electrified subatomic particles ejected from the outer atmosphere or corona of the Sun.

About thirty minutes after the front edge of the giant cloud passed over the Wind probe, it swept over Japan's GEOTAIL satellite, which was located on the sunward side of the Earth in its 120,000 X 40,000 mile elliptical orbit. GEOTAIL also gathered important scientific data. Minutes later, the disturbance struck the outer limits of the Earth's magnetic field, which acts as a protective buffer. The impact compressed the magnetic field on the sunward side of the Earth and stretched it out away from the Sun on the night side, triggering the magnetic storm and aurora.

"It was detected with instruments on Wind that sense the magnetic fields, particles and waves in interplanetary space," said Dr Ogilvie. "This is a good example of what we had been expecting since Wind was launched Nov. 1, 1994. This wonderful observation is a great first birthday present from Wind."

A complete analysis of the Oct.18 Wind data, and data from other spacecraft and instruments, may take months or years, but is expected to tell scientists much about how interplanetary disturbances propagate through space and affect the Earth's environment. Future disturbances are anticipated as the 11-year sunspot cycle is expected to peak shortly after the year 2000, according to NASA scientists.

EDITOR'S NOTE: A color drawing depicting the disturbance is available to news media representatives by calling the Headquarters Imaging Branch on 202/358-1900.

Photo numbers are: Color: 95-HC-651 B&W: 95-H-664

Users of the Internet World Wide Web can obtain background information on Wind, GEOTAIL and related space missions, and view scientific data on the Oct. 18 disturbance at the following URL:

http://bolero.gsfc.nasa.gov/~solart/cloud/cloud.html

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

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Franklin O'Donnell
Jet Propulsion Laboratory, Pasadena, CA
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Ann Hutchison
Ames Research Center, Mountain View, CA
(Phone: 415/604-4968)

For Release
November 7, 1995

NOTE TO EDITORS: N95-74

BRIEFINGS SET TO PREVIEW GALILEO'S ARRIVAL AT JUPITER

News briefings for the upcoming arrival of NASA's Galileo spacecraft to the planet Jupiter will be broadcast on NASA Television during the next two weeks. The planned briefings are:

- **Thursday, Nov. 9, 1 p.m. EST**
  (originating from NASA's Jet Propulsion Laboratory, Pasadena, CA)

Mission engineers and scientists will describe mission events set for Dec. 7 when Galileo's atmospheric probe will parachute into the clouds of the giant planet. The Galileo orbiter spacecraft will then fire an onboard rocket engine to slow itself down enough to be captured into orbit around Jupiter. Press room arrangements, news updates, television schedules and other media services planned for Dec. 7 also will be described.

- **Wednesday, Nov. 15, 1:30 p.m. EST**
  (originating from NASA's Ames Research Center, Mountain View, CA)

Scientific investigations to be conducted by Galileo's atmospheric probe will be explained.

A day-long Jupiter atmospheric science workshop will be held at Ames on Thursday, Nov. 16, from 1-7:30 p.m. EST. This workshop will not be televised.

The briefings will be carried live on NASA Television via Spacenet 2 Transponder 5, Channel 9, at 69 degrees west longitude frequency at 3880.0 megahertz, audio at 6.8 megahertz.

-end-

News Release

National Aeronautics and
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Ed Campion
Headquarters, Washington, DC
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Lisa Malone
Kennedy Space Center, FL
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For Release
November 7, 1995

NOTE TO EDITORS: N95-75

STS-74 COUNTDOWN BRIEFINGS/LAUNCH COVERAGE SET FOR NOV. 8-11

A series of briefings will begin tomorrow from NASA's Kennedy Space Center, FL, in connection with the scheduled Saturday launch of Space Shuttle Atlantis on mission STS-74.

On Nov. 10 at 9 a.m. EST, NASA managers will conduct a briefing on how STS-74 mission activities relate to ongoing work with the international Space Station. A pre-launch news conference will be held at 10 a.m. EST, to discuss STS-74 mission readiness and objectives. Also, NASA Televison will replay pre-flight briefings held last month at NASA's Johnson Space Center, Houston, TX.

Daily countdown status briefings also will be held to update news media on final processing activities prior to launch. Atlantis is scheduled to liftoff at 7:56 a.m. EST, Nov. 11.

Attached is a listing of times, subjects and participants for each briefing. Also noted are key STS-74 pre-launch activities and NASA Television replays.

-end-

STS-74 MISSION PRE-FLIGHT BRIEFINGS & KEY EVENTS

LAUNCH - 3 DAYS (Wednesday, November 8, 1995)

7:00 a.m. STS-74 Countdown Begins

9:00 a.m. Countdown Status Briefing
Moderator: KSC Public Information Officer (PIO)
Briefers: Bill Dowdell, Shuttle Test Director
Lesa Roe, Kennedy Space Center (KSC) STS-74 Payloads Manager
Ed Priselac, Shuttle Weather Officer

11:00 a.m STS-74 Crew Arrives at KSC Shuttle Landing Facility

LAUNCH - 2 DAYS (Thursday, November 9, 1995)

9:00 a.m. Countdown Status Briefing
Moderator: KSC PIO
Briefers: John Stealey, NASA Test Director
Lesa Roe, KSC STS-74 Payloads Manager
Ed Priselac, Shuttle Weather Officer

LAUNCH - 1 DAY (Friday, November 10, 1995)

9:00 a.m. Space Station Program Briefing
Moderator: HQ Public Affairs Officer
Briefers: Wil Trafton, Director, International Space Station, NASA Headquarters
Doug Stone, Vice President of international Space Station, Boeing

10:00 a.m. STS-74 Pre-Launch Press Conference
Moderator: KSC News Chief
Briefers: Tommy Holloway, NASA Shuttle Program Manager, Johnson Space Center (JSC)
Dr. Harry Holloway, Assoc. Admin, Office of Life & Microgravity Sciences, NASA Headquarters
Frank Culbertson, Acting Director, Phase One Program, JSC
Yuriy P. Semenov, President, RSC Energia
Valeriy V. Ryumin, RSC Energia
Dr. Steve MacLean, Director-General, Astronaut Program, CSA
Bob Sieck, Director of Shuttle Opertations, KSC
Capt. Scot Heckman, KSC Staff Weather Liaison

LAUNCH DAY (Saturday, November 11, 1995)

2:30 a.m. Begin NASA TV Coverage of STS-74 Launch Day Activities

7:56 a.m. LAUNCH OF SPACE SHUTTLE ATLANTIS ON MISSION STS-74

9:00 a.m. Post-Launch Press Conference
Moderator: KSC Launch Commentator
Briefers: Loren Shriver, Mgr., Launch Integration for the Shuttle Program
Jim Harrington, KSC Launch Director

All times listed are Eastern

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release

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(Phone: 202/358-1730)

November 7, 1995

VIDEO ADVISORY: V95-161

UPCOMING SHUTTLE MISSION HIGHLIGHTS ON NTV WEDNESDAY

On Wednesday NASA TV will air interviews with crewmembers of the upcoming Space Shuttle Atlantis STS-74 mission, due to launch Saturday from the Kennedy Space Center, FL. STS-74 will be the second in a series of docking missions between the American Space Shuttle fleet and the Russian Mir space station. NASA TV will then reair footage of the January 19 crash of an experimental aircraft, the X-31, that occurred at Edwards Air Force Base, CA. A Mishap Investigation Board has concluded that an accumulation of ice on an onboard system caused the aircraft to fail. A replay of features discussing the SURFSat student-built satellite that will be used for deep space communications research and development will close out the news file. *Video News Files are aired each day at noon, 3, 6 and 9 p.m. EST.*

ITEM #1: INTERVIEW -- WILLIAM SURLES "BILL" MCARTHUR, JR.
STS-74 mission specialist from North Carolina discusses upcoming flight.

ITEM #2: INTERVIEW -- CHRIS A. HATFIELD
Canadian astronaut discusses upcoming first flight aboard Shuttle.

ITEM #3: INTERVIEW -- JERRY L. ROSS
Mission specialist from Indiana discusses role in upcoming flight.

ITEM #4: REPLAY -- X-31 CRASH FOOTAGE
Crash of experimental aircraft from January 19, 1995.

ITEM #5: REPLAY -- SURFSat TO TEST NEW TRACKING STATIONS
Student-built satellite to help test space communications R&D.

ITEM #6: REPLAY -- INTERVIEW WITH DR. JOEL SMITH
Smith discusses SURFSat project.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

News Release

National Aeronautics and
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For Release

November 7, 1995

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Don Haley
Dryden Flight Research Center, Edwards, CA
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RELEASE: 95-203

ICE CAUSE OF X-31 CRASH

A Mishap Investigation Board studying the cause of the X-31 experimental aircraft accident on January 19, 1995, has concluded that an accumulation of ice in or on the unheated pitot-static system of the aircraft provided false airspeed information to the flight control computers, causing the aircraft to go out of control and crash.

The aircraft was one of two X-31s operated by an international test organization located at NASA's Dryden Flight Research Center, Edwards, CA. It was being flown back to Edwards Air Force Base following a research flight when it departed from controlled flight at an altitude of 20,000 feet and crashed near the northern boundary of Edwards. The pilot, Karl-Heinz Lang, Federal Republic of Germany, ejected safely.

The pitot-static pressure system, using a small tube called a Kiel probe at the nose of the aircraft, provided air speed data to instruments in the cockpit, the aircraft's flight control computers, and to the mission control center monitors at Dryden.

Near the final portion of the approximately 43-minute flight, ice formed in or around the pitot tube. This led to a false reading of total air pressure data and caused the aircraft's flight control system to automatically misconfigure for a lower speed. The aircraft suddenly began oscillating in all axes, pitched up to over 90 degrees angle of attack and became uncontrollable, prompting the pilot to eject.

The Board recommended that training be conducted on the system safety analysis process, that procedures be implemented to assure all test team members receive configuration change notices, and that improvements be made in the remaining X-31 to prevent similar single-point failures from causing catastrophic consequences.

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The X-31 was being flown to study the use of thrust vectoring as a way of enhancing the maneuverability of future fighter aircraft. The project was managed by the Advanced Research Projects Agency (ARPA), and included participation by NASA, the U.S. Navy, U.S. Air Force, Rockwell Aerospace, the Federal Republic of Germany and Daimler-Benz (formerly Deutsche Aerospace).

The initial flight phase of the highly successful program, which began in October 1990, was based at Palmdale, CA, where the aircraft were assembled by Rockwell Aerospace.

The mission flown by Lang on Jan. 19 was the 524th of the X-31 program. The flight set a record for the most flights of any experimental aircraft flown at Dryden. After the accident, the remaining X-31 was brought back to flight status and in June appeared at the Paris Air Show. Reviewers of the Air Show commented that "the X-31 manoeuvers steal the show" and "the Rockwell/DASAA X-31's daily flight display brought all other activity at the show to a stop."

- end-

Editors Note: Images of the X-31 aircraft are available via the Internet at the Dryden Flight Research Center's on-line photo archive. The World Wide Web URL is:

http://www.dfrf.nasa.gov/PhotoServer/photoServer.html

NASA press releases and other information are available automatically by sending an Internet electronic mail message to domo@hq.nasa.gov. In the body of the message (not the subject line) users should type the words "subscribe press-release" (no quotes). The system will reply with a confirmation via E-mail of each subscription. A second automatic message will include additional information on the service. Questions should be directed to (202) 358-4043.

News Release

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For Release
November 7, 1995

RELEASE: 95-204

SURFSAT SUCCESSFULLY LAUNCHED INTO SPACE

A satellite payload designed and built by college students was successfully launched Saturday from Vandenberg Air Force Base, CA, onboard a NASA launch vehicle.

Now in orbit 746 miles above Earth, SURFSat-1 rode piggy-back on the upper stage launch vehicle for Radarsat, a Canadian satellite. SURFsat carries low-power radio transmitters which send in three microwave bands to NASA tracking stations. SURFSat-1 is used for deep space communication research and development, and also will be used to test a new set of Earth orbit tracking stations.

The student project was initiated at NASA's Jet Propulsion Laboratory, Pasadena, CA, in 1987 as part of the Summer Undergraduate Research Fellowship (SURF) program of the California Institute of Technology. The first objective was to design, build, launch and operate a low-cost, low-power vehicle to be used to test the performance of space communication in the new Ka-band, at frequencies of approximately 32 Gigahertz.

NASA's Deep Space Network is being upgraded to support higher frequency Ka-band transmissions from planetary spacecraft. This will permit the use of more channels compared to current X-band deep space links. One purpose of the SURFSat payload is to test how Earth's atmosphere affects Ka-band signals. Despite the new band's potential advantages for deep space communication, it is expected to be affected more by weather than X-band transmissions.

SURFSat-1 carries a pair of beacons, one in each of the two bands, which imitate a probe far out in deep space by transmitting at only a thousandths of a

-more-

watt of power. As the satellite passes overhead, engineers can collect data allowing them to compare performance in each of the two bands over a wide range of elevation angles and weather conditions.

SURFSat-1 also carries an experiment to test ground stations supporting NASA's new Space Very Long Baseline Interferometry project. The stations will communicate with a spacecraft to be launched by Japan that will make radio astronomy studies of quasars and other objects at the edge of the universe.

When the project began in 1987, six Caltech students were chosen to begin SURFSat. Each summer, a new group of undergraduates took over. Through 1994, a total of 61 students, including those from other colleges, have participated. JPL provided a dedicated laboratory for the work and a test range and a lab at the Goldstone Deep Space Communications Complex. Three former SURF students are now full-time employees at JPL.

The original idea was to build a simple spacecraft appropriate to a student project and give students an opportunity to work with space technology. The solar-powered satellite consists of two aluminum boxes, about 12 inches by 12 inches by 16 inches permanently bolted to the guidance section of a NASA Delta II second stage booster. Shortly after launch it was separated from the primary payload, Radarsat, and moved into a polar orbit.

Cost of the SURFSat project from beginning to end was $3 million.

The primary SURFSat-1 experiment was supported by the Deep Space Network Advanced Systems Program, sponsored by the NASA Office of Space Communications. Support for the second experiment was provided by the U.S. Space Very Long Baseline Interferometry Project at JPL, sponsored by NASA's Astrophysics Division. Support for the integration of the satellite with the Delta II launch vehicle was provided by personnel of the Orbital Launch Service Office at the NASA Goddard Space Flight Center, Greenbelt, MD, and McDonnell Douglas Aerospace.

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Ed Campion/Ray Castillo
Headquarters, Washington, DC
(Phone: 202/358-1778)

November 7, 1995

RELEASE: 95-205

NASA TO PURSUE NON-COMPETITIVE SHUTTLE CONTRACT WITH U.S. ALLIANCE

NASA will pursue a non-competitive contract with United Space Alliance to eventually assume responsibility for Space Shuttle operations.

"This clearly is the appropriate path to take," said NASA Administrator Daniel S. Goldin. "It will allow us to ensure the safe operations of the Space Shuttle, meet the flight manifest and maintain our commitment to launch the first Space Station element in late 1997. I am committed to working with Congress to maximize the future commercial potential of the Station and make the best use of the American taxpayer's dollar."

Rockwell International and Lockheed Martin Corporation, which together hold 69 percent of the dollar value of all Shuttle related prime contracts, will form a joint venture, "United Space Alliance," to become the Space Flight Operations contractor.

Goldin said reaching a contract with U.S. Alliance depends on three factors. First, the two companies must form a viable, separate legal entity (U.S. Alliance) capable of operating the Shuttle program. Second, NASA and U.S. Alliance must negotiate a contractual arrangement that commits the contractor and provides appropriate incentives to maintain safety, meet the flight manifest and achieve program efficiencies. And third, the workforce which U.S. Alliance applies to the Space Flight Operations contract must possess sufficient experience with Shuttle operations that additional time-consuming training is unnecessary to keep the program progressing safely and efficiently.

"With Lockheed Martin and Rockwell, we have two experienced companies that clearly understand how to operate the Shuttle safely," Goldin said. "There's no new contractor or workforce to train, and because the two companies already have nearly 70 percent of the dollar value of all Shuttle-related prime contracts, the task of combining the existing separate contracts under the consolidated Shuttle contract will be greatly simplified. "

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Goldin said the Source Evaluation Board, which has been evaluating expressions of interest from companies in becoming the Space Flight Operations Contractor, concluded that a non-competitive contract with U.S. Alliance was clearly in the public interest. "There was no other company that could possibly meet our safety, manifest and schedule requirements," said Goldin. "Under all the circumstances, the advantages of contracting directly with U.S. Alliance outweigh any benefits from competition."

Goldin described the next steps which could lead to award of a non-competitive contract by September 1996.

- Both parties must agree on a Statement of Work which adequately describes what the Space Flight Operations Contractor must do in performance terms. "We will tell them what we want in terms of outcome, but we will not dictate the steps to get there," said Goldin.

- U.S. Alliance must prepare definitive technical and cost proposals that are responsive to the Statement of Work. These proposals must contain specific plans and commitments to reduce contract requirements, facilities and workforce.

- NASA will evaluate these proposals and use them to develop an agreed-upon contractual document that incorporates all of U.S. Alliance's obligations and provides appropriate incentives to ensure the contractor maintains safety, meets the flight manifest and achieves efficiencies.

- The parties must develop a phased contractual arrangement that commits U.S. Alliance to an initial effort to identify program efficiencies from within its current prime contracts and provides clear milestones to reach a final, definitive agreement on all aspects of Shuttle operations as soon as possible.

A single prime contract will reduce Shuttle costs by cutting out duplicative or unnecessary work while still performing all the work required for safe and reliable flights. Because NASA will no longer be heavily involved in the management of day-to-day Shuttle operations, fewer civil servants will be needed to manage the program.

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Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
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David E. Steitz
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For Release

November 8, 1995

VIDEO ADVISORY: V95-162

GALILEO BRIEFING, UPCOMING SHUTTLE FLIGHT PREVIEWS

On Thursday NASA TV air a press briefing from the Jet Propulsion Laboratory, Pasadena, CA, during which engineers and scientists will describe upcoming mission events for the Galileo spacecraft as it approaches Jupiter. Mission animation will be aired during this briefing. Starting at 3 p.m. EST, NASA TV's video news file will open with the Galileo mission animation, followed by footage of the Russian Mir 20 crew being launched from Baikonur, Russia. The current Mir crew was launched last September 3 and docked with the Mir on September 5. The Mir 20 crew are expected to return to Earth next February 29. The video news file will close with interviews with crewmembers of the upcoming STS-74 Shuttle mission. Shuttle Atlantis is due to launch Saturday from the Kennedy Space Center, FL. The STS-74 mission will be the second in a series of docking missions between the American Space Shuttle fleet and the Russian Mir space station. *Video News Files are aired each day at noon, 3, 6 and 9 p.m. EST.*

ITEM #1: GALILEO MISSION ANIMATION
Animation previewing upcoming spacecraft arrival at Jupiter.

ITEM #2: MIR 20 LAUNCH FROM BAIKONUR, RUSSIA
Current Mir crew's launch from Russia on September 3.

ITEM #3: INTERVIEW -- KENNETH D. CAMERON, MISSION COMMANDER
Ohio native discusses role as mission commander of STS-74.

ITEM #4: INTERVIEW -- JAMES DONALD HALSELL, JR., MISSION PILOT
Shuttle pilot from Louisiana discusses upcoming mission.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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News Release

National Aeronautics and
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Washington, DC 20546
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Don Savage
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For Release

November 13, 1995

RELEASE: 95-206

NASA SELECTS FUSE MISSION FOR DEVELOPMENT

As part of an overall restructuring of the Explorer program undertaken by NASA earlier this year, the Far Ultraviolet Spectroscopic Explorer (FUSE) mission has been selected for development leading up to a launch on an expendable launch vehicle in October 1998.

The $108 million mission, managed by the Johns Hopkins University, Baltimore, MD, will study the origin and evolution of the lightest elements -- hydrogen and deuterium -- created shortly after the Big Bang, and the forces and processes involved in the evolution of galaxies, stars and planetary systems. The far ultraviolet region of the spectrum can only be observed outside the Earth's atmosphere.

Dr. Wesley T. Huntress, Jr., NASA's Associate Administrator for Space Science, Washington, DC, approved the selection following reviews and acceptance by NASA in cooperation with the project's international partners, Canada and France.

The FUSE Principal Investigator, Dr. Warren Moos of Johns Hopkins, is responsible for mission success, including instrument and spacecraft development, integration and testing, ground system, science operations, mission operations and data analysis. NASA's Goddard Space Flight Center (GSFC), Greenbelt, MD, is responsible for program oversight and for providing the launch vehicle.

The Explorer Program, which started in 1958, provides Earth-orbiting satellites that conduct research in space physics and astrophysics. The program is managed by the Explorer Project Office at GSFC for the Office of Space Science.

- end -

News Release

National Aeronautics and
Space Administration

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Raj Khanna
Third World Foundation, College Park, MD
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For Release

November 21, 1995

NOTE TO EDITORS: N95-77

NASA SPONSORS SYMPOSIUM ON WORLD DISEASE CONTROL

Health officials and disease control experts will gather Nov. 28-30 at the Stouffer Renaissance Harborplace Hotel, Baltimore, MD, for a symposium on the use of satellites to monitor and control insect transmitted diseases.

Sponsored by NASA and the Third World Foundation of North America, the symposium will inform government officials from various countries of NASA's scientific and technological capabilities for detecting, monitoring, and improving the control of diseases such as malaria and cholera. Health ministers and medical directors from at least 20 countries including Bangladesh, Belize, China, Ghana, Indonesia, Kenya, Malaysia, Nigeria, Peru and Rwanda will attend.

The symposium will feature discussions on the economics of disease surveillance, deforestation and urbanization. In addition, participants will discuss ideas for joint activities between NASA and other interested countries. NASA's Office of Life and Microgravity Sciences, Washington, DC, manages the Agency's global monitoring and human health research program in conjunction with the National Institutes of Allergy and Infectious Diseases and the Centers for Disease Control.

The symposium, which begins at 9 a.m. EST, is open to the media. A complete agenda is available from the NASA Headquarters Newsroom by calling 202/358-1600. To register for the symposium, media should call the Science and Technology Corp., Hampton, VA, at 804/865-0332.

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Video Advisory

National Aeronautics and
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For Release

November 21, 1995

VIDEO ADVISORY: V95-164

HUBBLE VIEWS YOUNG STARS ON NTV WEDNESDAY

On Wednesday, NASA TV will air recent images from the Hubble Space Telescope showing four newly discovered protoplanetary disks around young stars in the Orion Nebula. Gas and dust disks, long suspected by astronomers to be present during the early stages of planetary formation, can be directly seen in visible light by the Hubble.

Video News Files are aired each day at noon, 3, 6 and 9 p.m. EST.

ITEM #1: YOUNG STARS IN ORION NEBULA
Recently discovered protoplanetary disks around young stars.
ITEM #2: EDGE-ON DISK IN ORION NEBULA
Dust disk seen edge-on around newborn star in Orion Nebula.
ITEM #3: MOSAIC OF THE ORION NEBULA
Animation builds color panoramic mosaic of center of Orion Nebula.
ITEM #4: ORION NEBULA FLY-THROUGH
Sequence pans and pulls-out from Hubble images of Orion Nebula.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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News Release

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For Release
November 21, 1995

RELEASE: 95-208

COSMIC RAY MYSTERY MAY BE SOLVED

Physicists from Japan and the United States have discovered a possible solution to the puzzle of the origin of high energy cosmic rays that bombard Earth from all directions in space.

Using data from the Japanese/U.S. X-ray astronomical satellite ASCA, physicists have found what they term "the first strong observational evidence" for the production of these particles in the shock wave of a supernova remnant, the expanding fireball produced by the explosion of a star.

"We are very pleased to contribute to the solution of an 83-year old mystery," said Dr. Koyama, of the Department of Physics at Kyoto University, Kyoto, Japan.

Cosmic rays were discovered in 1912 by the Austrian physicist Victor Hess, who subsequently received the Nobel Prize in Physics for that work. They are subatomic particles, mostly electrons and protons, that travel near the speed of light. Ever since their discovery, scientists have debated where cosmic rays come from and how ordinary subatomic particles can be accelerated to such high speeds. Supernova remnants have long been thought to provide the high energy cosmic rays, but the evidence has been lacking until now.

The international team of investigators used the satellite to determine that cosmic rays are generated at a high rate in the remains of the Supernova of 1006 AD -- which appeared to medieval viewers to be as bright as the Moon -- and that they are accelerated to high velocities by a process first suggested by the nuclear physicist Enrico Fermi in 1949.

The satellite contains telescopes for simultaneously taking images and spectra of X-rays from celestial sources, allowing astronomers to distinguish different types of X-ray emission from nearby regions of the same object.

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The tell-tale clue to the discovery was the detection of two oppositely-located regions in the rapidly expanding supernova remnant, the debris from the stellar explosion. The two regions glow intensely in what is called synchrotron radiation, which is produced when electrons move at nearly the speed of light through a magnetic field in space. The remainder of the supernova remnant, in contrast, produces ordinary "thermal" X-ray emission, meaning radiation from hot gases such as oxygen, neon, and gaseous forms of magnesium, silicon, sulfur, and iron.

The cosmic rays are accelerated in the two regions that glow with synchrotron radiation, the physicists concluded. Specifically, charged particles are accelerated to nearly the speed of light and energies of 100 trillion electron volts as they bounce off turbulent regions inside the shock front from the supernova explosion. This amount of energy is over 50 times higher than can be produced in the most powerful particle accelerator on Earth. Like a ping pong ball bouncing between a table and a paddle while the paddle is brought ever closer to the table, an electron, proton or an atomic nucleus bounces back and forth within the supernova remnant, continually gaining speed, until it attains a high energy. This process was first proposed as a theory by Fermi in 1949.

"Since we found cosmic ray acceleration under way in the remnant of Supernova 1006, this process probably occurs in other young supernova remnants," according to Dr. Robert Petre, of NASA's Goddard Space Flight Center's Laboratory for High Energy Astrophysics, Greenbelt, MD. Astronomers estimate that there is a supernova explosion in the Milky Way galaxy, which contains the Earth, about once every 30 years. Supernova 1006 is classified by astronomers as the explosion of a white dwarf star, known as a Type IA supernova. Other types of supernovae, involving the collapse of massive stars in the Milky Way, and in galaxies beyond, may also produce cosmic rays.

The discovery observations were made with solid-state X-ray cameras on the ASCA satellite, which was launched from Kagoshima Space Center, Japan, aboard a Japanese M-3S-II rocket on Feb. 20, 1993. Major contributions to the scientific instrumentation were provided by Goddard's Laboratory for High Energy Astrophysics and by the Center for Space Research at the Massachusetts Institute of Technology.

"The capability to obtain spatially resolved X-ray spectra -- that is to determine the different spectra at various locations in an image -- is a tremendous advance in space technology," said Dr. Stephen Holt, Director of Space Sciences at Goddard.

Approximately 25 cosmic rays bombard one square inch every second in space just outside the Earth's atmosphere. The atmosphere shields the surface of the Earth from these "primary" cosmic rays. However, collisions of the primary cosmic rays with atoms in the upper atmosphere produce slower moving "secondary" cosmic rays, some of which reach ground level and even may penetrate to depths of many feet below the ground.

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News Release

National Aeronautics and
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For Release
November 22, 1995

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Ray Villard
Space Telescope Science Institute, Baltimore, MD
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NOTE TO EDITORS: N95-78

FIRST IMAGE OF A BROWN DWARF TO BE PRESENTED AT NOV. 29 UPDATE

Astronomers will present evidence and the first image ever obtained of the most elusive type of star -- a brown dwarf -- at 3 p.m. EST, Wed., Nov. 29, 1995 in the NASA Headquarters Auditorium, 300 E Street S.W., Washington, DC.

Using telescopes on Mt. Palomar to make their discovery and NASA's Hubble Space Telescope to confirm it, astronomers say the star is too large and hot to be classified as a planet, but too small and cool to shine like a star. However, the star's atmosphere is remarkably similar to Jupiter's.

The image will be presented at NASA's Space Science Update (SSU). Panelists will be:

- Shrinivas "Shri" Kulkarni, California Institute of Technology, Pasadena (co-author)
- Sam Durrance, The Johns Hopkins University, Baltimore (co-author)
- Aleksander "Alex" Wolszczan, Pennsylvania State University, State College
- Anne Kinney, Space Telescope Science Institute, Baltimore
- Steve Maran, Goddard Space Flight Center, Greenbelt, MD (moderator)

The SSU will be carried live on NASA Television, with 2-way question and answer capability for reporters covering the event from participating NASA Centers. NASA Television is carried on Spacenet-2, transponder 5, channel 9, at 69 degrees West longitude, frequency 3880.0 MHz, audio 6.8 Megahertz.

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News Release

National Aeronautics and
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Washington, DC 20546
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For Release

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November 22, 1995

RELEASE: 95-209

COMET SAMPLE RETURN MISSION PICKED AS NEXT DISCOVERY FLIGHT

A spacecraft designed to gather samples of dust spewed from a comet and return the dust to Earth for detailed analysis has been selected to become the fourth flight mission in NASA's Discovery program.

Known as Stardust, the mission also will gather and return samples of interstellar dust that the spacecraft encounters during its trip through the Solar System to fly by a comet called Wild-2 in January 2004. Stardust was one of three Discovery mission proposals selected for further study as part of a February 1995 announcement by NASA that a Moon-orbiting mission called Lunar Prospector had been selected as the third Discovery flight.

"Stardust was rated highest in terms of scientific content and, when combined with its low cost and high probability of success, this translates into the best return on investment for the nation," said Dr. Wesley T. Huntress Jr., NASA Associate Administrator for Space Science. "The Stardust team also did an excellent job of updating their plan to communicate the purpose and results of this exciting mission to educators and the public."

The Stardust mission team is led by Principal Investigator Dr. Donald Brownlee of the University of Washington in Seattle, with Lockheed-Martin Astronautics, Denver, as the contractor building the spacecraft. NASA's Jet Propulsion Laboratory, Pasadena, CA, will provide project management.

Comet Wild-2 is known as a "fresh comet" because its orbit was deflected from much farther out in the Solar System by the gravitational attraction of Jupiter in 1974. Stardust will approach as close as 62 miles to the comet's nucleus.

"Space scientists are intensely interested in comets because we believe that most of them are well-preserved remnants from the earliest days of star and planetary formation," Huntress said. "Stardust should also give us some unique guidance about how to focus the science we plan to conduct a few years later with a surface lander on a different comet during the international Rosetta mission."

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Stardust will be launched on an expendable launch vehicle in February 1999 for a total mission cost to NASA in real-year dollars of $199.6 million. The return capsule carrying the dust samples would parachute to Earth for landing on a dry Utah lake bed in January 2006.

Stardust will use an unusual material called aerogel to capture the dust samples. This porous, extremely low density material is somewhat like glass in that it is made of silica -- a pure form of sand -- and it has about the same melting point. Although aerogel does not absorb moisture, the strangely fluorescent substance can absorb large amounts of gas or particle matter due to its remarkable internal surface area.

The spacecraft also will carry an optical camera that should return cometary images with 10 times the clarity of those taken of Halley's Comet by previous space missions, as well as a mass spectrometer provided by Germany to perform basic compositional analysis of the samples while in-flight.

Stardust was selected over a proposed mission to study the circulation of the atmosphere of Venus, known as the Venus Multiprobe, and a proposed mission to collect samples of particle matter from the Sun, called Suess-Urey. These three missions and Lunar Prospector were among 28 Discovery proposals submitted to NASA in October 1994 in response to an August 1994 announcement of opportunity.

The first two missions in the Discovery program will be launched in 1996, in February and December, respectively: the Near Earth Asteroid Rendezvous, a small spacecraft that will orbit and study the asteroid Eros beginning in January 1999; and, the Mars Pathfinder, designed to place a small lander and robotic rover on the surface of Mars in July 1997.

Formally started in NASA's FY 1994 budget, the Discovery program features small planetary exploration spacecraft with focused science goals that can be built in 36 months or less, for less than $150 million, not including cost of launch vehicle. The program grew out of a series of discussions and workshops that NASA has held with the space science community.

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Internet Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
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For Release

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Headquarters, Washington, DC
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November 27, 1995

INTERNET ADVISORY: I96-16

NEW PHOTOGRAPHS OF SHUTTLE AND MIR AVAILABLE VIA INTERNET

Several new photographs of the joint space flight effort between the United States and Russia are now available via the Internet on the Today@NASA home page. The photographs include views never before seen of the Space Shuttle Atlantis docked to the Mir space station and two of Atlantis shortly after undocking from the station.

The photographs are available via the World Wide Web at URL:

http://www.hq.nasa.gov/office/pao/NewsRoom/today.html

The photographs were taken from a Soyuz spacecraft by Mir-19 Cosmonaut Nikolai M. Budarin on July 4, 1995 near the end of the first docking mission between the Space Shuttle and Mir during Shuttle Mission STS-71.

Atlantis docked to the Mir station on June 29, 1995, and undocked on July 4, 1995. Joining the STS-71 crew for Atlantis' return home was the Mir-18 crew, which included Astronaut Norm Thagard, the first American to live and work aboard the orbiting Russian station.

Any use of these photographs in publications should carry a photo credit of "Russian Space Agency photo courtesy of NASA."

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NASA press releases and other information are available automatically by sending an Internet electronic mail message to domo@hq.nasa.gov. In the body of the message (not the subject line) users should type the words "subscribe press-release" (no quotes). The system will reply with a confirmation via E-mail of each subscription. A second automatic message will include additional information on the service. Questions should be directed to (202) 358-4043.

Video Advisory

National Aeronautics and
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Washington, DC 20546
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David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

For Release

November 27, 1995

VIDEO ADVISORY: V95-166

NEW SHUTTLE/MIR PHOTOS, DISEASE RESEARCH ON NTV

On Tuesday NASA television will air new photographs of the Space Shuttle Atlantis docked to the Mir space station and two photographs of Atlantis shortly after undocking from the station last July. The photographs were taken from a Soyuz spacecraft by Mir-19 Cosmonaut Nikolai M. Buradin last July 4, near the end of the first docking mission between the Space Shuttle and the Mir during Shuttle Mission STS-71. (Any use of these photographs in publications should carry a photo credit of "Russian Space Agency photo courtesy of NASA.")

Following the new photographs, NASA TV will air a feature and interviews on research the Agency is conducting to understand the molecular structure of Schistosomiasis, a disease caused by parasites found in contaminated water that kills 200 to 300 million people each year. The disease is second only to malaria in annual worldwide deaths. Using highly specialized X-ray equipment and protein crystallization techniques developed for space-based microgravity research, NASA researchers have been able to build a computer picture or "blueprint" of the Schistosoma enzyme structure. *Video News Files are aired each day at noon, 3, 6 and 9 p.m. EST.*

ITEM 1: PHOTOGRAPHS OF SHUTTLE ATLANTIS AND MIR SPACE STATION

Series of four photographs, including Atlantis docked with Mir and Atlantis shortly after undocking.

ITEM #2: SCHISTOSOMIASIS RESEARCH

B-roll and interviews with researchers battling disease at NASA's Marshall Space Flight Center, Huntsville, AL.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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News Release

National Aeronautics and
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Washington, DC 20546
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Michael Braukus
Headquarters, Washington, DC
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For Release

November 28, 1995

RELEASE: 95-210

NASA AWARDS LIFE AND BIOMEDICAL SCIENCES RESEARCH GRANTS

NASA has selected 46 proposals to receive two and three-year grants for conducting ground-based or space-borne life sciences research, totaling approximately $15 million.

The purpose of these grants is to encourage science and technology research in the space life sciences. The grants funded through this annual NASA research announcement support a program of research that conducts experiments on Earth and in space to provide the basic understanding of the role of gravity in biological processes.

Sponsored by NASA's Office of Life and Microgravity Sciences and Applications, Washington, DC, this research offers investigators the opportunity to take advantage of NASA's life and biomedical sciences research facilities to improve the understanding of fundamental biological processes.

NASA received 380 proposals in response to this research announcement. The proposals were subjected to a fully external peer-review through assembled panels made up of scientific and technical experts. The selected proposals represent the following areas: space biology (16); space physiology and countermeasures (11); environmental health (2); space radiation health (3); space human factors (3); advanced life support (5); advanced extravehicular activity systems (1); advanced technology development (2); data analysis (2) and interdisciplinary proposals (1).

NASA's life and biomedical sciences grants provide investigators with the opportunity to study and characterize basic biological mechanisms in ways not possible on Earth. By using access to space as a research tool, NASA-sponsored research will advance fundamental knowledge of the way in which weightlessness, radiation, and other aspects of the spaceflight environment interact with biological processes. These grants also seek to enhance the application of this knowledge to procedures and technologies that enable humans to live, work and explore in space and to benefit the health and well-being of people on Earth.

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The scientists selected for NASA life sciences research grants are:

Clarence P. Alfrey, M.D., Ph. D., Baylor College of Medicine, Houston, TX
Mark G. Allen, Ph. D., Physical Sciences, Inc., Andover, MA
Gordon L. Amidon, Ph. D., University of Michigan, Ann Arbor, MI
Mary H. Barcellos-Hoff, Ph. D., Lawrence Berkeley Laboratory, Berkeley, CA
Wilhelm Becker, Ph. D., Universitat Hamburg, Hamburg, Germany
Volker Blum, Ph. D., Ruhr-Universitat of Bochum, Bochum, Germany
David P. Cadogan, ILC Dover, Inc., Frederica, DE
Daniel J. Cosgrove, Ph. D., Pennsylvania State University, University Park, PA
Brian L. Davis, Ph. D., The Cleveland Clinic Foundation, Cleveland, OH
Daniel L. Feeback, Ph. D., NASA Johnson Space Center, Houston, TX
Arny A. Ferrando, Ph. D., Shriners Burns Institute, Galveston, TX
Suzanne M. Fortney, Ph. D., NASA Johnson Space Center, Houston, TX
Alan S. Gevins, Sc. D., EEG Systems Laboratory, San Francisco, CA
Ary L. Goldberger, M.D., Beth Israel Hospital, Boston, MA
Karl H. Hasenstein, Ph. D., University of Southwest Louisiana, Lafayette, LA
Eileen M. Hasser, Ph. D., University of Missouri-Columbia, Columbia, MO
Bertold Hock, Ph.D., University of Munihen at Weikenstephan, Freising, Germany
Michael F. Holick, M.D., Ph. D., Boston University School of Medicine, Boston, MA
Kenneth C. Jenks, NASA Johnson Space Center, Houston, TX
Christian J. Lambertsen, M.D., University of Pennsylvania Medical Center, Philadelphia, PA
Terri L. Lomax, Ph. D., Oregon State University, Corvallis, OR
James C. Maida, NASA Johnson Space Center, Houston, TX
Patrick H. Masson, Ph. D., University of Wisconsin, Madison, WI
Gordon A. McFeters, Ph. D., Montana State University, Bozeman, MT
Robert J. Peterka, Ph. D., Legacy Good Samaritan Hospital, Portland, OR
Duane L. Pierson, Ph. D., NASA Johnson Space Center, Houston, TX
Marc D. Porter, Ph. D., Iowa State University, Ames, IA
Hinrich Rahmann, Ph. D., University of Stuttgart-Hohenheim, Stuttgart, Germany
Stanley J. Roux, Ph. D., The University of Texas at Austin, Austin, TX
David W. Rowe, M.D., University of Connecticut Health Center, Farmington, CT
Mitchell B. Schaffler, Ph. D., Henry Ford Hospital, Detroit, MI
Heide Schatten, Ph.D., University of Wisconsin, Madison, WI
Martin P. Schreibman, Ph. D.; Brooklyn College, CUNY, Brooklyn, NY
Daniel Serfaty, Alphatech, Inc., Burlington, MA
Sergei I. Sukharev, Ph. D., University of Wisconsin, Madison, WI
Kwangjae Sung, Ph. D., NASA Johnson Space Center, Houston, TX
Arthur J. Sytkowski, M.D., Harvard Medical School, Boston, MA
James G. Tidball, Ph. D., University of California, Los Angeles, CA
Russell T. Turner, Ph. D., Mayo Foundation, Rochester, MN
Charles A. Waldren, Ph. D., Colorado State University, Fort Collins, CO
Ronald L. Walsworth, Ph. D., Smithsonian Institution, Cambridge, MA
Raymond L. Warters, Ph. D., University of Utah School of Medicine, Salt Lake City, UT
Randy O. Wayne, Ph. D., Cornell University, Ithaca, NY
Darrell J. Wiens, Ph. D., University of Northern Iowa, Cedar Falls, IA

- end -

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

November 28, 1995

Steve Roy
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0034)

RELEASE: 95-211

NASA SCIENTISTS GAIN INSIGHT INTO DEADLY DISEASE

Scientists at NASA's Marshall Space Flight Center in Huntsville, AL, have taken an important step in understanding the molecular structure of a disease that afflicts 200 to 300 million people and is second only to malaria in cause of death worldwide. The disease, known as Schistosomiasis, is caused by parasites found in contaminated water.

"We were able to determine a three-dimensional atomic structure of an important enzyme from one of four species of parasites known to cause schistosomiasis," explained Dr. Daniel Carter, research director and chief of Marshall's Biophysics and Advanced Materials Branch of the Space Sciences Laboratory. "That allowed us to identify critical parts of the enzyme's surface structure which elicit the immune responses to the disease. This important step seems to offer the most potential for developing vaccines that protect people against the entire species of schistosomiasis parasites, not just one species," said Carter.

Using highly specialized X-ray equipment and protein crystallization techniques developed for space-based microgravity research, biophysics researchers were able to locate key positions of individual atoms in the enzyme, also a major target for drugs used in the treatment of schistosomiasis, and build a computer picture or blueprint of the schistosoma enzyme structure.

The determination of the enzyme structure offers the possibility of combining such techniques as the use of disease fighting drugs with the development of preventative vaccines to form an effective barrier against the transmission of schistosomiasis.

- more -

"Building a person's immunity is one way to fight schistosomiasis," explained Carter. "Many people are repeatedly infected with the disease. If we can break the life cycle of the parasite by vaccinating people against transmission of the disease, we can make a major step toward eliminating the threat of schistosomiasis in those parts of the world where it poses a major health hazard."

The research has paid dividends in other areas as well, said Carter. "Information gained in the search for a particular atomic structure often helps us learn more quickly about other research targets," he said. "For instance, a three-dimensional crystal structure of a schistosomiasis enzyme joined with atomic structural components of Human Immunodeficiency Virus type 1 (HIV-1) has also been resolved. This structural, building-block approach to HIV research has helped us learn more about the structure of HIV proteins, which have proven very difficult to crystallize and thus study more thoroughly," said Carter.

Schistosomiasis research at Marshall was performed in collaboration with the Institute of Applied Microbiology in Vienna, Austria, and the Center For Advanced Research in Biotechnology of the National Institute of Standards in Washington, DC.

Also known as bilharzia, schistosomiasis is a disease caused by any of four parasitic flatworms or flukes. Persons can become infected with schistosomiasis when they wade or swim in contaminated fresh water by exposure to skin-penetrating, free-swimming larvae. Schistosomiasis is known to occur in parts of Brazil, Egypt, sub-Saharan Africa, southern China, the Philippines and Southeast Asia. There is no vaccine against the disease.

- end -

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Don Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

November 29, 1995
EMBARGOED UNTIL 3 P.M. EST

Jim Sahli
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-0697)

Ray Villard
Space Telescope Science Institute, Baltimore, MD
(Phone: 410/338-4514)

RELEASE: 95-212

ASTRONOMERS ANNOUNCE FIRST CLEAR EVIDENCE OF A BROWN DWARF

Astronomers have made the first unambiguous detection and image of an elusive type of object known as a brown dwarf.

The evidence consists of an image from the 60-inch observatory on Mt. Palomar, a spectrum from the 200-inch Hale telescope on Mt. Palomar and a confirmatory image from NASA's Hubble Space Telescope. The collaborative effort involved astronomers at the California Institute of Technology, Pasadena, CA, and the Johns Hopkins University, Baltimore, MD.

The brown dwarf, called Gliese 229B (GL229B), is a small companion to the cool red star Gliese 229, located 18 light-years from Earth in the constellation Lepus. Estimated to be 20 to 50 times the mass of Jupiter, GL229B is too massive and hot to be classified as a planet as we know it, but too small and cool to shine like a star. At least 250,000 times dimmer than Earth's Sun, the brown dwarf is the faintest object ever seen orbiting another star.

"This is the first time we have ever observed an object beyond our Solar System which possesses a spectrum that is astonishingly just like that of a gas giant planet," said Shrinivas Kulkarni, a member of the team from Caltech.

Kulkarni added, however, that "it looks like Jupiter, but that's what you'd expect for a brown dwarf." The infrared spectroscopic observations of GL229B, made with the 200-inch Hale telescope at Palomar, show that the dwarf has the spectral 'fingerprint' of the planet Jupiter -- an abundance of methane. Methane is not seen in ordinary stars, but it is present in Jupiter and other giant gaseous planets in our Solar System.

-more-

The Hubble data obtained and analyzed so far already show the object is far dimmer, cooler (no more than 1,300 degrees Fahrenheit) and less massive than previously reported brown dwarf candidates, which are all near the theoretical limit (eight percent the mass of our Sun) where a star has enough mass to sustain nuclear fusion.

Brown dwarfs are a mysterious class of long-sought objects that form the same way stars do, that is, by condensing out of a cloud of hydrogen gas. However, they do not accumulate enough mass to generate the high temperatures needed to sustain nuclear fusion at their core, which is the mechanism that makes stars shine. Instead, brown dwarfs shine in the same way that gas giant planets like Jupiter radiate energy, that is, through gravitational contraction. In fact, the chemical composition of GL229B's atmosphere looks remarkably like that of Jupiter.

The discovery is an important first step in the search for planetary systems beyond the Solar System because it will help astronomers distinguish between massive Jupiter-like planets and brown dwarfs orbiting around other stars. Advances in ground- and space-based astronomy are allowing astronomers to further probe the "twilight zone" between larger planets and small stars as they search for sub-stellar objects, and eventually, planetary systems.

Caltech astronomers Kulkarni, Tadashi Nakajima, Keith Matthews, and Ben Oppenheimer, and Johns Hopkins scientists Sam Durrance and David Golimowski first discovered the object in October 1994. Follow-up observations a year later were needed to confirm it is actually a companion to Gliese 229. The discovery was made with a 60-inch reflecting telescope at Palomar Observatory in southern California, using an image-sharpening device called the Adaptive Optics Chronograph, designed and built at the Johns Hopkins University.

The same scientists teamed up with Chris Burrows of the Space Telescope Science Institute to use Hubble's Wide Field Planetary Camera-2 for follow-up observations on November 17. Another Hubble observation six months from now will yield an exact distance to GL229B.

The astronomers suspect that the brown dwarf developed during the normal star-formation process as one of two members of a binary system. "All our observations are consistent with brown dwarf theory," Durrance said. However, the astronomers say they cannot yet fully rule out the possibility that the object formed out of dust and gas in a circumstellar disk as a "super-planet."

Astronomers say the difference between planets and brown dwarfs is based on how they formed. Planets in the Solar System are believed to have formed out of a primeval disk of dust around the newborn Sun because all the planets' orbits are nearly circular and lie almost in the same plane. Brown dwarfs, like full-fledged stars, would have fragmented and gravitationally collapsed out of a large cloud of hydrogen but were not massive enough to sustain fusion reactions at their cores.

The orbit of GL229B could eventually provide clues to its origin. If the orbit is nearly circular, then it may have formed out of a dust disk, where viscous forces in the dense disk would keep objects at about the same distance from their parent star. If the dwarf formed as a binary companion, its orbit probably would be far more elliptical, as seen on most binary stars. The initial Hubble observations will begin providing valuable data for eventually calculating the brown dwarf's orbit. However, the orbital motion is so slow, it will take many decades of telescopic observations before a true orbit can be calculated.

Astronomers have been trying to detect brown dwarfs for three decades. Their lack of success is partly due to the fact that as brown dwarfs age they become cooler, fainter, and more difficult to see. An important strategy used by the researchers to search for brown dwarfs was to view stars no older than a billion years. Caltech's Nakajima reasoned that, although brown dwarfs of that age would be much fainter than any known star, they would still be bright enough to be spotted.

"Another reason brown dwarfs were not detected years ago is that imaging technology really wasn't up to the task," Golimowski said. With the advent of sophisticated light sensors and adaptive optics, astronomers now have the powerful tools they need to resolve smaller and dimmer objects near stars.

Hubble was used to look for the presence of other companion objects as bright as the brown dwarf which might be as close to the star as one billion miles. No additional objects were found, though it doesn't rule out the possibility of Jupiter-sized or smaller planets around the star, said the researchers.

The results will also appear in the November 30 issue of the journal Nature and the December 1 issue of the journal Science.

The Space Telescope Science Institute is operated by the Association of Universities for Research in Astronomy, Inc. (AURA) for NASA, under contract with the Goddard Space Flight Center, Greenbelt, MD. The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency (ESA).

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EDITOR'S NOTE: Images of GL229B are available to news media representatives by calling the Headquarters Imaging Branch on 202/358-1900. Photo numbers are:

	Color	**B&W**
GL229B Image	95-HC-705	95-H-718

Image files in GIF and JPEG format, captions, and press release text may be accessed on Internet via anonymous ftp from ftp.stsci.edu in /pubinfo:

	GIF	JPEG
Brown Dwarf Gl229B	gif/Gl229B.gif	jpeg/Gl229B.jpg

Higher resolution digital versions (300dpi JPEG) of the release photograph will be available temporarily in /pubinfo/hrtemp:
95-48.jpg (color) and 95-48b.jpg (black & white).
GIF and JPEG images, captions and press release text are available via World Wide Web at URL http://www.stsci.edu/pubinfo/PR/95/48.html, or via links in http://www.stsci.edu/pubinfo/Latest.html, and in http://www.stsci.edu/pubinfo/Pictures.html.

News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

Brian Welch
Headquarters, Washington, DC
(Phone: 202/358-1600)

November 29, 1995

RELEASE: 95-213

YVONNE FREEMAN APPOINTED PROVOST OF CLARK ATLANTA UNIVERSITY

Dr. Yvonne B. Freeman, NASA's Associate Administrator for Equal Opportunity Programs since January 1993, has been appointed as Provost and Vice President for Academic Affairs of Clark Atlanta University, Atlanta, GA. George E. Reese, NASA Deputy General Counsel, has been named acting Associate Administrator for Equal Opportunity Programs.

In noting Freeman's departure, NASA Administrator Daniel S. Goldin said, "I want to congratulate and thank Yvonne for her energetic and innovative approach to equal opportunity and diversity programs at NASA. She has aggressively changed the way NASA conducts its equal opportunity activities, and the entire NASA institution has benefited from her remarkable vision and achievements." In particular, Goldin cited Freeman's role in establishing NASA as one of the top six federal agencies with strong support for minority institutions' participation in federal programs. In 1995, NASA's total support for minority university research and education programs is $66.7 million.

Freeman's appointment to Clark Atlanta University, effective January 4, 1996, is intended to help enhance the University's development as a world class institution for scientific research and graduate training. Freeman will serve as the Provost and chief academic officer of the University, reporting directly to the University President, and will direct all instructional and academic support programs at the University.

Reese, Deputy General Counsel since November 1993, has worked in the Agency's Office of General Counsel since August 1977. Before assuming the position of Deputy General Counsel, Reese was Associate General Counsel for General Law for six years, and before that, Senior Attorney and Attorney-Advisor.

During his 18 years at NASA, Reese has worked on numerous cases related to equal opportunity and employment issues. He is currently the NASA representative and U.S. delegate to the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space, and he served for many years as the Chairman of the NASA Contract Adjustment Board.

-end-

News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

Don Savage
Headquarters, Washington, DC
(Phone: 202/358-1547)

December 1, 1995

NOTE TO EDITORS: N95-79

NASA SCIENCE INSTITUTES REPORT AVAILABLE FOR PUBLIC COMMENT

The NASA Science Institutes Plan is available for public comment by the science community, industry, NASA employees and the public via the Internet. The comment period closes Jan. 5, 1996.

In addition, a draft NASA Science Institutes Benchmarks report also is available for general information. It concludes that the eleven science institutes proposed as an outgrowth of an earlier Agency streamlining review, known as the Zero-Base Review, are in various stages of readiness. Only three are recommended for near-term initiation: the Biomedical Research Institute at the Johnson Space Center, Houston, the Astrobiology Institute at the Ames Research Center, Mountain View, CA, and the Microgravity Institute at the Lewis Research Center, Cleveland, OH. The remaining Institutes proposed by the Review require modifications or further study.

The report, provided for general information, considers processes and attributes of other research organizations with similar missions and identifies best practices to be considered in the establishment of NASA Science Institutes.

Copies of the report are available to the news media from the Headquarters Newsroom by calling 202/358-1600, as well as on the Internet at the NASA Headquarters anonymous file transfer protocol (FTP) site: ftp.hq.nasa.gov. Log in as: anonymous and use your E-mail ID as your password. Go to the directory: pub/oss/inst/. A "readme.txt" file in this directory contains further instructions. If you have a World Wide Web browser that supports ftp downloads, you may retrieve these documents from the Office of Space Science (OSS) home page at the URL address: http://www.hq.nasa.gov/office/oss. Click on the "What's New Link."

Reporters requesting an interview with Al Diaz, Deputy Associate Administrator for the Office of Space Science and Chair of the NASA Science Institutes Planning and Integration Team, should call 202/358-1547, or fax requests to 202/358-3093.

- end -

News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

December 1, 1995

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Headquarters, Washington, DC
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Franklin O'Donnell
Jet Propulsion Laboratory, Pasadena, CA
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RELEASE: 95-215

GALILEO CROSSES BOUNDARY INTO JUPITER'S ENVIRONMENT

NASA's Galileo spacecraft radioed confirmation late this week that it has entered Jupiter's environment, crossing over the boundary from interplanetary space into the giant magnetic cocoon around Jupiter called the magnetosphere.

"With the spacecraft now in the magnetosphere, we begin our first direct measurements of the Jupiter system," said Galileo Project Manager William J. O'Neil at NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA.

Data from Galileo's magnetometer confirmed that the spacecraft passed the milestone on Nov. 26 at a distance of about six million miles (nine million kilometers) from Jupiter's cloud tops, scientists announced today.

After a six-year voyage through the Solar System, Galileo is less than a week away from taking up permanent residence around Jupiter. On Thursday, Dec. 7, Galileo's previously deployed atmospheric probe will plunge into Jupiter's cloud tops at 5:56 p.m. EST and descend into the giant planet on a parachute.

Overhead, the Galileo spacecraft itself will collect and record data radioed from the probe during the 40- to 75-minute probe mission. At 8:19 p.m. EST, an hour after the probe mission is completed, Galileo will begin to fire its onboard rocket to slow down and allow itself to be captured into orbit around Jupiter to begin a two-year mission of closeup studies of Jupiter's large moons, the planet itself, and continuous measurements of the magnetosphere.

Jupiter's magnetosphere is like a giant bubble around the planet. A shock wave -- called "bowshock" after the wave that builds before the bow of a ship -- exists where the magnetosphere faces the stream of charged particles flowing outward from the Sun, called the solar wind. As the solar wind flows around Jupiter, the magnetosphere tapers off like a wind sock, with the whole invisible structure moving in response to buffeting by the solar wind.

-more-

Galileo scientists said they first saw signs of the bowshock on Nov. 16, but the bowshock apparently moved back and forth in response to alternate gusts and waning of the solar wind. "As the solar wind velocity increased, the shock moved inside the position of the spacecraft leaving Galileo again in the solar wind," said Dr. Margaret Galland Kivelson of the University of California at Los Angeles, the principal investigator on Galileo's magnetometer experiment.

This crossing and recrossing of the shockwave happened several times, she said, between the first shock encounter on Nov. 16, when the spacecraft was about nine million miles (15 million kilometers) from Jupiter, and Nov. 26 when Galileo finally crossed the main bowshock at 1 p.m. EST at about six million miles out from Jupiter's cloud tops.

The magnetometer science team also found the first direct evidence that the jovian magnetosphere was either unaffected or had recovered in the aftermath of last year's impact of Comet Shoemaker-Levy with Jupiter. Some scientists had theorized that the magnetosphere might have been modified signficantly by the violent impact, but that appears not to be the case, according to data from Galileo.

Meanwhile, Galileo engineers report that work has been completed on the spacecraft's tape recorder to assure its readiness for recording data during Thursday's atmospheric probe descent. Final fine-tuning of the spacecraft's flight path is scheduled for this Saturday, Dec. 2.

Two Internet home pages exist to provide information on the atmospheric probe, Galileo orbiter spacecraft, mission operations and science returns. The Galileo Project home page may be accessed at http://www.jpl.nasa.gov/galileo. A home page sponsored by the atmospheric probe team at NASA Ames Research Center, Mountain View, CA, may be accessed at http://ccf.arc.nasa.gov/galileo_probe/.

NOTE TO EDITORS: A press briefing prior to the probe mission and Galileo's Jupiter orbit-entry will be held at JPL on Dec. 7 at 4 p.m. EST, and a follow-up briefing will be held at 9:45 p.m. EST. Both events will be carried live on NASA Television.

NASA Television is available through the Spacenet 2 satellite, transponder 5, channel 9, 69 degrees West longitude, frequency 3880 MHz, audio subcarrier 6.8 MHz, horizontal polarization.

-end-

Video Advisory

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

For Release

December 4, 1995

VIDEO ADVISORY: V95-168

GALILEO MISSION TO JUPITER ON NTV MONDAY

NASA TV will air footage of the 1990 launch and deployment of the Galileo spacecraft and interviews discussing the expected science. After a six-year voyage through the Solar System, Galileo is less than a week away from taking up permanent residence around Jupiter. On Thursday, Dec. 7, Galileo's previously deployed atmospheric probe will plunge into Jupiter's cloud tops at 5:56 p.m. EST and descend into the giant planet on a parachute.

Video News Files are aired each day at noon, 3, 6 and 9 p.m. EST.

ITEM #1: GALILEO LAUNCH AND DEPLOYMENT
Footage of Galileo launch and deployment from Space Shuttle Atlantis

ITEM #2: INTERVIEW -- FRANK DIAZ
Astronomer discusses what science Galileo will provide and the feeling when the spacecraft was deployed

ITEM #3: INTERVIEW -- DON WILLIAMS
The commander of the Space Shuttle mission that launched and deployed Galileo discusses the science that will be achieved

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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Video Advisory

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For Release

David E. Steitz
Headquarters, Washington, DC
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December 4, 1995

VIDEO ADVISORY: V95-169

COVERAGE OF THE GALILEO MISSION TO JUPITER CONTINUES TUESDAY

NASA TV will air new animation depicting the Galileo Probe's entry into Jupiter's atmosphere, as well as images from the Hubble Space Telescope showing the evolution of the Probe's target site on the massive planet. NASA TV will replay footage of the October 1989 launch and deployment of the Galileo spacecraft and interviews discussing the expected science. After a six-year voyage through the Solar System, Galileo is less than a week away from taking up permanent residence around Jupiter. On Thursday, Dec. 7, Galileo's previously deployed atmospheric probe will plunge into Jupiter's cloud tops at 5:56 p.m. EST and descend into the giant planet using a parachute.

Video News Files are aired each day at noon, 3, 6 and 9 p.m. EST.

ITEM #1: GALILEO DROPS IN ON JUPITER
New animation depicting the Galileo Probe entering Jupiter's atmosphere.

ITEM #2: GALILEO'S TARGET
A sequence of photos from the Hubble Space Telescope showing the evolution of the Galileo Probe target site on Jupiter.

ITEM #3: REPLAY -- GALILEO LAUNCH AND DEPLOYMENT
Footage of Galileo launch and deployment from Space Shuttle Atlantis.

ITEM #4: REPLAY -- INTERVIEW -- ASTRONAUT FRANKLIN R. CHANG-DIAZ
Mission specialist discusses what science Galileo will provide and his feelings when the spacecraft was deployed from the Space Shuttle.

ITEM #5: REPLAY -- INTERVIEW -- ASTRONAUT DONALD E. WILLIAMS
Commander of the Space Shuttle STS-34 mission that launched and deployed Galileo discusses the science that will be achieved.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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News Release

National Aeronautics and
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Washington, DC 20546
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For Release

December 4, 1995

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RELEASE: 95-216

HUBBLE FINDS NEW BLACK HOLE AND UNEXPECTED MYSTERIES

Confirming the presence of yet another super-massive black hole in the universe, astronomers using NASA's Hubble Space Telescope have also found unexpected new mysteries.

The black hole and an 800 light-year-wide spiral-shaped disk of dust fueling it, are slightly offset from the center of their host galaxy, NGC 4261, located 100 million light-years away in the direction of the constellation Virgo.

This discovery is giving astronomers a ringside seat to bizarre, dynamic processes that may involve a titanic collision and a runaway black hole. This relatively nearby galaxy could shed light on how far more distant active galaxies and quasars produce their prodigious amounts of energy.

The results are being presented today by the team consisting of Laura Ferrarese and Holland Ford of the Johns Hopkins University, Baltimore, MD, and Walter Jaffe of the Leiden University, the Netherlands, at a press conference at the European Space Agency (ESA), Paris, in conjunction with the "Science With Hubble Space Telescope II" workshop.

"I'm delighted by this new finding. It doesn't fit our expectations, and this should lead us to a new understanding of black holes," Ford said. "The new Hubble observations have moved us beyond the question of whether black holes exist. Now we can work on the demographics of black holes and address a number of other questions: does every galaxy have a black hole? How do they work in detail?"

- more -

Predicted by Einstein's general theory of relativity, a black hole is an extremely compact and massive object that has such a powerful gravitational field that nothing, not even light, can escape. This is the second super-massive black hole confirmed by Hubble. By measuring the speed of gas swirling around the black hole, Ford and co-investigators were able to calculate its mass to be 1.2 billion times the mass of the Sun, yet concentrated into a region of space not much larger than the Solar System.

The strikingly geometric disk -- which contains enough mass to make 100,000 stars like the Sun -- was first identified in Hubble observations made in 1992. These new Hubble images reveal for the first time structure in the disk, which may be produced by waves or instabilities in the disk.

The disk is mysterious because it is unusual to find dust in elliptical galaxies like NGC 4261, which stopped making stars long ago due to the absence of the requisite raw materials: interstellar gas and dust. The most conventional explanation is that the disk is the remnant of a smaller galaxy that fell into the core of NGC 4261. The black hole will swallow the gas from the intruder over the next 100 million years, and in the process produce spectacular fireworks, researchers predict.

Such collisions may have been more common in the past, when the expanding universe was smaller. This would help explain the abundance of quasars and active galaxies in the distant past. However, according to theoretical simulations, it's difficult, dynamically, to get an intruder galaxy to plunge directly into a galaxy's core. Another possibility is that dust ejected from ancient stars in the galaxy has fallen into the core and formed a disk. But this does not explain why the disk is off-center, which is evidence for a dynamic close encounter.

Equally as puzzling is the discovery that the black hole is offset from the center of the galaxy, and the disk's center as well. Astronomers say that because the black hole is the astronomical equivalent of the "800-pound gorilla," what can move it around? Presumably, the black hole was once at the center of the galaxy, but something has pulled it 20 light-years from the center, according to the Hubble observations. However, the black hole is so massive, scientists are searching for some way to explain how it could have been moved.

One exotic idea is that the black hole is self-propelled. The cold, dusty disk serves as a rocket "fuel tank" by feeding material onto the black hole where gravity compresses and heats it to tens of millions of degrees. Hot gas exhausts out from the black hole's vicinity producing the radio jets observed by radio telescopes as twin-lobe structures extending far beyond the galaxy. This exhaust may be pushing the black hole across space just like a rocket engine which propels an object by rapidly ejecting mass. Radio observations confirm the presence of a jet in NGC4261.

Hubble is ideally suited for hunting super-massive black holes in the universe. With the astronomical equivalent of surgical precision, Hubble's spectrographs can measure the rotation of gas near enough to a suspected black hole to capture its unmistakable gravitational signature. The speed of gas orbiting a black hole will rapidly increase toward the center of the disk -- just as the planets closer to our Sun orbit faster.

To date, two other galaxies have confirmed black holes. Hubble detected a 2.4-billion-solar-mass black hole identified in the core of elliptical galaxy M87 in 1994, and later that year, astronomers using a radio telescope array to examine the dynamics of a thin, warped disk of molecules deep in the core of spiral galaxy NGC 4258, measured a 40-million-solar-mass black hole.

Ford and his colleagues continue using Hubble to survey both active and quiescent galaxies to determine if black holes are commonly found in most galaxies.

The Space Telescope Science Institute is operated by the Association of Universities for Research in Astronomy, Inc. for NASA, under contract with the Goddard Space Flight Center, Greenbelt, MD. The Hubble Space Telescope is a project of international cooperation between NASA and ESA.

- end -

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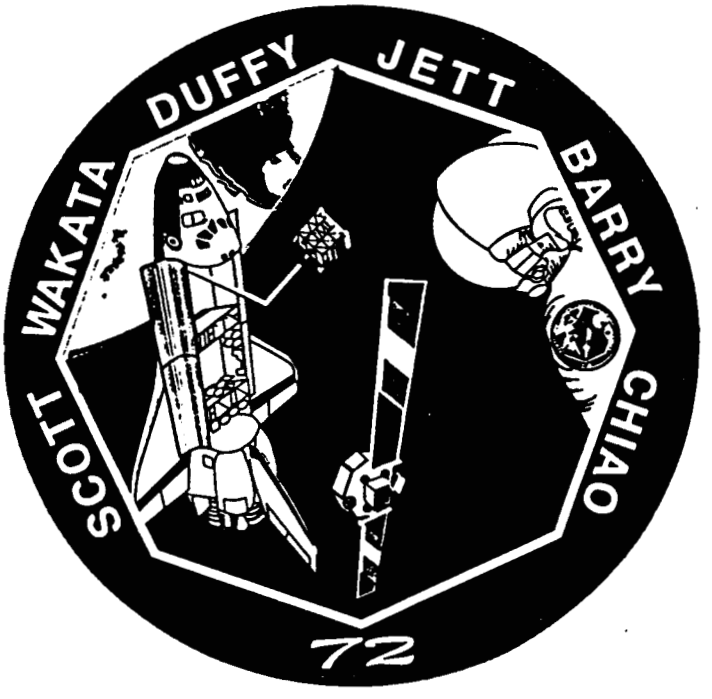
95-217

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SPACE SHUTTLE MISSION STS-72

PRESS KIT
JANUARY 1996



SPACE FLYER UNIT-RETRIEVAL (SFU-RET)
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For Information on STS-72 Experiments & Activities

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Mike Braukus Headquarters, Wash., DC	PCG, NIH-R-3, NIH-C-5	202/358-1979

CONTENTS

RELEASE: 95-217

RETRIEVAL OF TWO RESEARCH SATELLITES, TWO SPACEWALKS HIGHLIGHT NASA'S FIRST SHUTTLE MISSION OF 1996

In the first Space Shuttle mission of 1996, six astronauts aboard Endeavour will retrieve a Japanese satellite, deploy and retrieve a NASA science satellite and conduct two spacewalks to demonstrate and evaluate techniques to be used in the assembly of the International Space Station.

The STS-72 crew will be commanded by Brian Duffy who will be making his third Shuttle flight. Brent Jett will serve as pilot and will be making his first space flight. The four STS-72 mission specialists aboard Endeavour will include Leroy Chiao, Mission Specialist-1, who will be making his second flight, Winston Scott, Mission Specialist-2, Koichi Wakata from the Japanese Space Agency (NASDA) serving as Mission Specialist-3, and Daniel Barry, Mission Specialist-4, all of whom will be making their first space flight.

Launch of Endeavour on the STS-72 mission is currently targeted for Jan. 11, 1996, at approximately 4:18 a.m. EST from Kennedy Space Center's Launch Complex 39-B. The STS-72 mission is scheduled to last eight days, 22 hours, 36 minutes. An on-time launch on Jan. 11 would produce a landing at Kennedy Space Center's Shuttle Landing Facility on Jan. 20 at 2:54 a.m. EST.

The major activities of the mission will include retrieval of the Japanese Space Flyer Unit (SFU), which was launched March 18 aboard a Japanese H-2 rocket to conduct a variety of microgravity experiments. In addition, the STS-72 crew will deploy the OAST-Flyer, a satellite developed by NASA's former Office of Aeronautics and Space Technology, which will fly free of the Shuttle for about 50 hours. Four experiments on the science platform will operate autonomously before the satellite is retrieved by Endeavour's robot arm.

Three of Endeavour's astronauts will conduct a pair of spacewalks during the mission to test hardware and tools that will be used in the assembly of the Space Station starting in late 1997.

The STS-72 mission will be the 10th mission for Endeavour and the 74th for the Space Shuttle system.

- end -

Media Services Information

NASA Television Transmission

NASA television is available through the Spacenet-2 satellite system. Spacenet-2 is located on Transponder 5, at 69 degrees West longitude; frequency 3880.0 MHz, audio 6.8 MHz.

The schedule for television transmissions from the orbiter and for mission briefings will be available during the mission at Kennedy Space Center, FL; Marshall Space Flight Center, Huntsville, AL; Dryden Flight Research Center, Edwards, CA; Johnson Space Center, Houston, and NASA Headquarters, Washington, DC. The television schedule will be updated to reflect changes dictated by mission operations.

Television schedules also may be obtained by calling COMSTOR 713/483-5817. COMSTOR is a computer database service requiring the use of a telephone modem. A voice update of the television schedule is available daily at noon Eastern time.

Status Reports

Status reports on countdown and mission progress, on-orbit activities and landing operations will be produced by the appropriate NASA newscenter.

Briefings

A mission press briefing schedule will be issued prior to launch. During the mission, status briefings by a Flight Director or Mission Operations representative and when appropriate, representatives from the payload team, will occur at least once each day. The updated NASA television schedule will indicate when mission briefings are planned.

Internet Information

The NASA Headquarters Public Affairs Internet Home Page provides access to the STS-74 mission press kit and status reports. The address for the Headquarters Public Affairs Home Page is:
http://www.nasa.gov/hqpao/hqpao_home.html.

Informational materials, such as status reports and TV schedules, also are available from an anonymous FTP server at **ftp.hq.nasa.gov/pub/pao**. Users should log on with the user name "anonymous" (no quotes), then enter their e-mail address as the password. Within the /pub/pao directory there will be a "readme.txt" file explaining the directory structure.

Pre-launch status reports from KSC are found under **ftp.hq.nasa.gov/pub/pao/statrpt/ksc**, and mission status reports can be found

under **ftp.hq.nasa.gov/pub/pao/statrpt/jsc**. Daily TV schedules can be found under **ftp.hq.nasa.gov/pub/pao/statrpt/jsc/tvsked**.

Access by fax

An additional service known as fax-on-demand will enable users to access NASA informational materials from their fax machines. Users calling (202) 358-3976 may follow a series of prompts and will automatically be faxed the most recent Headquarters news releases they request.

STS-72 QUICK LOOK

Launch Date/Site:	Jan. 11, 1996/KSC Launch Pad 39-B
Launch Time:	4:18 AM EST
Launch Window:	1 hour
Orbiter	Endeavour (OV-105), 10th flight
Orbit Altitude/Inclination:	250 nautical miles/28.45 degrees
Mission Duration:	8 days, 22 hours, 36 minutes
Landing Date:	Jan. 20, 1996
Landing Time:	2:54 AM EST
Primary Landing Site:	Kennedy Space Center, FL
Abort Landing Sites:	Return to Launch Site - KSC Transoceanic Abort Sites - Ben Guerir, Morocco Abort-Once Around - Edwards Air Force Base, CA
Crew:	Brian Duffy, Commander (CDR) Brent Jett, Pilot (PLT) Leroy Chiao, Mission Specialist 1 (MS 1) Winston Scott, Mission Specialist 2 (MS 2) Koichi Wakata, Mission Specialist 3 (MS 3) Daniel Barry, Mission Specialist 4 (MS 4)
EVA Crewmembers:	Leroy Chiao (EV1), Dan Barry (EV2) for EVA 1 Leroy Chiao (EV1), Winston Scott (EV2) for EVA 2
Cargo Bay Payloads:	Space Flyer Unit (after retrieval) OAST-Flyer SSBUV EDFT-03 SLA-01/GAS
In-Cabin Payloads:	NIH-R STL/.NIH-C PCG-STES CPCG

Developmental Test Objectives/Detailed Supplementary Objectives

DTO 301D: Ascent Structural Capability Evaluation
DTO 305D: Ascent Compartment Venting Evaluation
DTO 306D: Descent Compartment Venting Evaluation
DTO 307D: Entry Structural Capability
DTO 312: ET TPS Performance
DTO 414: APU Shutdown Test
DTO 415: Water Spray Boiler Electrical Heater Capability
DTO 664: Cabin Temperature Survey
DTO 667: Portable In-Flight Landing Operations Trainer
DTO 668: Advanced Lower Body Restraint Test
DTO 671: EVA Hardware for Future Scheduled EVA Missions
DTO 672: EMU Electronic Cuff Checklist
DTO 700-5: Trajectory Control Sensor
DTO 700-8: Global Positioning System Development Flight Test
DTO 805: Crosswind Landing Performance
DTO 833: EMU Thermal Comfort and EVA Worksite Thermal Evaluation
DTO 1210: EVA Operations Procedures Training DTO
DSO 330: In-Flight Evaluation of Urine Monitoring System
DSO 483: Back Pain in Microgravity
DSO 487: Immunological Assessment of Crewmembers
DSO 489: EVA Dosimetry Evaluation
DSO 491: Characterization of Microbial Transfer Among Crewmembers
DSO 492: In-Flight Evaluation of a Portable Clinical Blood Analyzer
DSO 493: Monitoring Latent Virus Reactivation and Shedding in Astronauts
DSO 494: Influence of Microgravity and EVA on Pulmonary Oxygen Exchange
DSO 603: Orthostatic Function During Entry, Landing and Egress
DSO 604: Visual-Vestibular Integration as a Function of Adaptation
DSO 802: Educational Activities
DSO 901: Documentary Television
DSO 902: Documentary Motion Picture Photography
DSO 903: Documentary Still Photography

STS-72 CREW RESPONSIBILITIES

Payloads	Prime	Backup
Space Flyer Unit Systems	Scott	Wakata
OAST-Flyer Systems	Scott	Wakata
PARE/NIH-R	Barry	Scott
STL/NIH-C	Scott	------
SSBUV	Barry	------
PCG-STES	Wakata	Jett
CPCG	Chiao	Wakata
Getaway Special Canisters	Barry	------
Shuttle Laser Altimeter	Jett	------
Other Activities		
Remote Manipulator System	Wakata	Jett
Earth Observations	Duffy	Chiao
EVA 1	Chiao (EV 1)	Barry (EV 2)
EVA 2	Chiao (EV 1)	Scott (EV 3)
Intravehicular Crewmember	Scott (EVA 1)	Barry (EVA 2)
Rendezvous	Jett	Chiao

SHUTTLE ABORT MODES

Space Shuttle launch abort philosophy aims toward safe and intact recovery of the flight crew, orbiter and its payload. Abort modes for STS-72 include:

* **Abort-To-Orbit (ATO)** -- Partial loss of main engine thrust late enough to permit reaching a minimal 105-nautical mile orbit with the orbital maneuvering system engines.

* **Abort-Once-Around (AOA)** -- Earlier main engine shutdown with the capability to allow one orbit of the Earth before landing at the Kennedy Space Center, FL.

* **TransAtlantic Abort Landing (TAL)** -- Loss of one or more main engines midway through powered flight would force a landing at Ben Guerir, Morocco.

* **Return-To-Launch-Site (RTLS)** -- Early shutdown of one or more engines, and without enough energy to reach a TAL site, would result in a pitch around and thrust back toward Kennedy until within gliding distance of the Shuttle Landing Facility.

PAYLOAD AND VEHICLE WEIGHTS

Vehicle/Payload	**Pounds**
Orbiter (Endeavour) empty and 3 SSME's	152,755
Space Flyer Unit	7,885
OAST-Flyer	2,643
Remote Manipulator System	994
Commercial Protein Crystal Growth	70
PARE/NIH-R	197
Detailed Test/Supplementary Objectives	483
PCG/STES	70
Space Tissue Loss	66
Shuttle Laser Altimeter/GAS Canisters	4484
Shuttle System at SRB Ignition	4,514,966
Orbiter Weight at Landing	217,000

MISSION SUMMARY TIMELINE

Flight Day 1:
Launch/Ascent
OMS-2 Burn
Remote Manipulator System Checkout
SFU Retrieval Rendezvous Burn

Flight Day 2:
Secondary Payload Activation
EMU Checkout
SFU Retrieval Rendezvous Burns

Flight Day 3:
SFU Rendezvous, Retrieval and Berthing
Cabin Depress
Orbital Adjustment Maneuvers

Flight Day 4:
Secondary Payload Experiments
OAST-Flyer Deployment and Separation Maneuvers

Flight Day 5:
EVA 1 (6 1/2 hours)
OAST-Flyer Rendezvous Burns

Flight Day 6:
OAST-Flyer Rendezvous, Retrieval and Berthing

Flight Day 7:
EVA 2 (6 1/2 hours)
Cabin Repress

Flight Day 8:
Off-Duty Time (4 hours)
DSOs
Secondary Payload Experiments

Flight Day 9:
Flight Control System Checkout
Reaction Control System Hot-Fire
Crew News Conference
Experiment Deactivation
Cabin Stow

Flight Day 10:
Deorbit Prep
Deorbit Burn
Entry
KSC Landing

STS-72 ORBITAL EVENTS SUMMARY
(Based on a Jan. 11, 1996 Launch)

EVENT	MET	TIME OF DAY (EST)
Launch	0/00:00	4:18 AM, Jan. 11
OMS-2	0/00:43	5:01 AM, Jan. 11
EMU Checkout	1/00:00	4:18 AM, Jan. 12
Space Flyer Unit Retrieval	2/00:35	4:53 AM, Jan. 13
OAST-Flyer Deploy	3/02:25	6:43 AM, Jan. 14
EVA-1 Begins	3/19:45	12:03 AM, Jan. 15
EVA-1 Ends	4/01:45	6:03 AM, Jan. 15
OAST-Flyer Retrieval	5/00:32	4:50 AM, Jan. 16
EVA-2 Begins	5/19:15	11:33 PM, Jan. 16
EVA-2 Ends	6/01:15	5:33 AM, Jan. 17
Crew News Conference	7/20:00	12:18 AM, Jan. 19
Deorbit Burn	8/21:36	1:54 AM, Jan. 20
KSC Landing	8/22:36	2:54 AM, Jan. 20

SPACE FLYER UNIT-RETRIEVAL (SFU-RET)

Endeavour's rendezvous and retrieval of the Space Flyer Unit satellite begins with the Shuttle's precisely timed launch, putting the orbiter on a course that will continually close in on the Japanese satellite during the following 48 hours.

Almost immediately after reaching orbit, Mission Specialist Koichi Wakata will perform a checkout of Endeavour's mechanical arm to ensure it is ready for the capture of the SFU. During the next two days, periodic engine firings by Endeavour will adjust the rate at which the Shuttle is closing in on the SFU, aiming to reach a point about eight nautical miles behind the satellite on Flight Day 3, the starting point for the final phase of rendezvous.

About three hours before the planned capture of SFU, Commander Brian Duffy will fire Endeavour's engines, performing a Terminal Initiation (TI) burn that will bring Endeavour the final distance to the SFU during the next orbit of Earth. As Endeavour traverses the final eight nautical miles to the satellite, the Shuttle will enable its rendezvous radar system to lock onto the spacecraft. The radar will provide Endeavour with constant updates of the range to SFU and the rate at which the Shuttle is closing in on the satellite. Also, just after the TI burn is completed, Wakata will again power up the mechanical arm and extend it above Endeavour's payload bay in a position ready for the capture.

Endeavour will have the opportunity to perform four, small Mid-Course Correction (MCC) engine firings as it approaches the SFU, although some or all of the firings may not be necessary depending on the accuracy of the Shuttle's navigation. The Shuttle will perform what flight controllers refer to as an R-Bar approach to the SFU, approaching from underneath the satellite. When Endeavour reaches a point almost a half mile directly below the spacecraft, about one and a half hours before the planned capture, Duffy will take over manual control of the Shuttle to fly the final distance to the satellite.

Duffy will brake Endeavour's approach toward the SFU using jets that fire in the direction of the satellite until reaching a point about 600 feet below the spacecraft. At that point, Duffy will switch the Shuttle's steering jet system to a mode called Low Z, a mode that uses offset jets on the nose and tail to brake Endeavour's approach rather than those pointing directly at the SFU. The Low-Z mode guards against inadvertently contaminating the SFU with exhaust from the Shuttle jets. During the manual approach, information on the distance to SFU and closing rate of Endeavour provided by the rendezvous radar, will be supplemented by a handheld ranging device operated by Mission Specialist Leroy Chiao. In addition, graphics and data from the payload bay laser will be provided to Duffy on a laptop computer display, called the Rendezvous and Proximity Operations Program (RPOP), to aid with the approach.

Duffy will continue to slow Endeavour and align the Shuttle and SFU until reaching a point about 150 feet below the satellite, where he will stationkeep. As Duffy approaches the stationkeeping point, Japanese flight controllers for the SFU will send commands to retract the solar arrays in preparation for the retrieval. Then, as Endeavour remains stationary, solar array retraction will be completed and the SFU will be commanded to the proper orientation for retrieval. The satellite's reaction control system thrusters will be turned off as the Shuttle begins its final approach.

Duffy will continue the approach to SFU after about 45 minutes of stationkeeping, when the SFU commanding and safing has been successfully completed. As Endeavour approaches the final feet toward SFU, Duffy will perform a small yaw maneuver to align with the satellite. Using views from a camera mounted at the end of the mechanical arm, Duffy and Wakata will refine Endeavour's orientation with the grapple fixture mounted on the SFU.

Wakata will then move the mechanical arm to grab the fixture and lock onto the satellite. Once captured, Wakata will use the arm to lower the SFU into Endeavour's middle rear cargo bay, eventually locking it in place by closing four payload retention latches.

OAST FLYER/SPARTAN PROJECT

SPARTAN PROJECT

The Spartan Project is designed to provide easy and inexpensive access to Earth orbit via the Space Shuttle for science experiments that need to take measurements in orbit but away from the Shuttle.

The Spartan spacecraft is a small, rectangular, free-flying vehicle, measuring roughly 3.2 feet (1 meter) x 4.1 feet (1.25 meter) x 4.9 feet (1.5 meters). It is released from the Shuttle and picked up after several days of conducting its experiments. With the reusable carrier's flexibility, an unprecedented five Spartan missions were manifested to launch in a 22 month period beginning in September 1994 and ending in June 1996.

Initiated by the then-Office of Aeronautics and Space Technology at NASA Headquarters (OAST) and currently sponsored by the Office of Space Access and Technology (OSAT), OAST-Flyer comes near the end of this time period with a group of technology demonstration experiments located on a Spartan spacecraft.

OAST-FLYER

OAST-Flyer, the seventh Spartan to launch, is composed of four experiments: REFLEX, GADACS, SELODE, and SPRE. Two of the four experiments, REFLEX and

GADACS, are sponsored by OSAT. SELODE is sponsored by the Office of Safety and Mission Assurance and the fourth experiment, SPRE, is a volunteer effort comprised of University of Maryland students, area engineers, and space industry contractors. More information on the Spartan Project and its payloads is available via the Internet at the following address:

http://sspp.gsfc.nasa.gov/home740.html

Return Flux Experiment (REFLEX)

Spacecraft can be limited in lifetime by exposure to the space environment in several ways. One is the contamination of lenses, sensors, and instruments as they get coated with tiny particles of dirt.

REFLEX is a technology experiment designed to determine if the computer-generated models, which help determine how much contamination a spacecraft might get, are accurate. The main objective of REFLEX is to investigate molecular backscattering or "return flux," associated with on-orbit spacecraft. This phenomenon occurs when spacecraft give off the tiny particles of dirt into the atmosphere which then collide with other particles and bounce back to the spacecraft. Return flux is believed to be one of the factors that scientists have been unable to calculate into their computer-generated models. REFLEX also will study the erosion of spacecraft surface coatings as a result of particles chemically reacting with the atmosphere.

Global Positioning System (GPS) Attitude Determination and Control Experiment (GADACS)

The primary objective of the GADACS experiment is to demonstrate the use of the Global Positioning System (GPS) technology in space. During the flight, this experiment will use GPS to determine the attitude of the Spartan, the location and velocity of the spacecraft, and provide accurate timing for one portion of the Spartan mission. GADACS will use the GPS data to calculate the Spartan orientation and fire thrusters to point the spacecraft in different directions. This will be the first time a spacecraft is controlled using GPS.

After the Spartan is released, the Shuttle will move off to a distance of about 60 miles. At the end of the Spartan mission, the Shuttle will fly back to retrieve the Spartan. Through cooperation with researchers at the NASA Johnson Space Center in Houston, a GPS receiver will also be flown on the Space Shuttle to allow the team to determine the distance and velocity between the two vehicles. This unique portion of the experiment will remain active until the spacecraft is retrieved by the Shuttle.

Until GADACS, spacecraft used costly gyroscopes, star trackers, or Sun or Earth sensors to determine their attitude. The experiments planned on GADACS will pave new trails for lighter, less costly missions of the future.

Solar Exposure to Laser Ordnance Device (SELODE)

Pyrotechnic devices are used in numerous applications on space vehicles. Frequently they are used to separate different parts of a vehicle, such as the explosive bolts and nuts that are used to connect and then separate the Space Shuttle Orbiter from the External Tank. Today, most pyrotechnic devices are fired with electricity, but, this presents a number of problems. One major area of difficulty is sensitivity to accidental firing from stray electrical energy sources such as radio transmitter signals or the same kind of static electricity produced by shuffling your feet across a carpet on a dry day.

A new family of pyrotechnic devices is being developed that uses a laser pulse traveling through a fiber optic cable to trigger the explosive charge. This eliminates the concern of accidental firing from stray electrical energy sources.

SELODE was developed to test the safety and reliability of five different types of laser ordnance devices. The primary investigation centers on the effects of direct and concentrated sunlight in the space environment on different explosives and design methods. Flight testing will evaluate accidental firing levels, and post-flight testing will examine the effects of exposure on the chemical stability of the explosives.

SPARTAN PACKET RADIO EXPERIMENT (SPRE)

The Spartan Packet Radio Experiment (SPRE) is an amateur radio (HAM radio) communications experiment. The primary mission is to test satellite tracking using amateur packet radio and a GPS. SPRE was developed and built by the University of Maryland Amateur Radio Association with assistance from NASA, volunteer engineers, and software professionals.

The primary mission of SPRE will be to relay ground station positions and transmit telemetry containing the GPS location of the spacecraft and housekeeping data. This type of technology has many applications in both the amateur radio and commercial world. Low cost Low Earth Orbit satellites could be used to track storms, weather balloons, boats at sea, trucks, etc. The satellite could collect the location data from ground targets and download it to a central ground control station or many remote stations. Schools requiring more information can send requests via electronic mail to Ken McCaughey at: **kenneth@w3eax.umd.edu**

OAST-Flyer Deploy and Retrieval Activities

The Office of Aeronautics and Space Technology-Flyer (OAST-FLYER) satellite will be deployed by Endeavour on the fourth day of the mission and will spend about 48 hours flying free from the Shuttle before it is retrieved on Flight Day 6.

The OAST-FLYER experiments are mounted on a standard Shuttle Pointed Autonomous Research Tool for Astronomy (SPARTAN) carrier platform. STS-72 will be the sixth Shuttle flight to deploy and retrieve a SPARTAN platform, a satellite system that operates autonomously once released. SPARTAN normally has no communications with either the ground or Shuttle in flight. However, on STS-72, an amateur-radio based experiment, called the SPARTAN Packet Radio Experiment, will be tested as a method of communications with one of the OAST-FLYER experiments, the REFLEX. Still, no communications regarding the general operations of SPARTAN will be available.

Following a thorough in-bay checkout of the experiments aboard the OAST-FLYER, three latches holding the satellite in Endeavour's cargo bay, two on either side and one underneath, will be released. While Astronaut Jett temporarily turns off Endeavour's steering jets to avoid any disturbances, Wakata will lift the OAST-FLYER from the bay using the mechanical arm.

With the robot arm extended high above the bay, Wakata will release the satellite. Following release, the SPARTAN platform will perform a small maneuver to confirm its health before Jett backs Endeavour away.

During the two days the spacecraft is flying free, Endeavour will perform occasional engine firings to maintain a distance of about 90 nautical miles between the two spacecraft.

Endeavour will perform a rendezvous and approach to the OAST-FLYER on Flight Day 6 similar to the one for the SFU retrieval. At the conclusion of its science operations, SPARTAN will automatically maneuver into the proper orientation for retrieval and await the Shuttle's arrival.

The final phase of the OAST-FLYER rendezvous begins from a point about eight nautical miles behind the satellite, when Endeavour's engines are fired in the Terminal Initiation (TI) burn about two hours before the planned capture. The TI burn will put Endeavour on a course to intercept the OAST-FLYER over about one orbit of Earth, performing an R-Bar approach from underneath the satellite. Endeavour's rendezvous radar system and a handheld laser will be used during the approach to provide information on the distance and closing rate between the Shuttle and the satellite.

Duffy will take over manual control of the approach when Endeavour reaches a point almost one-half mile directly below the OAST-FLYER, about 45 minutes before the planned capture. Duffy will fire Endeavour's thrusters facing toward the OAST-FLYER to brake the Shuttle's approach until reaching a distance of about 200 feet from the satellite. At that point, Duffy will switch the thrusters to a Low-Z mode, firing thrusters offset to the OAST-FLYER to slow Endeavour and avoid contaminating the satellite with exhaust from the Shuttle steering jets.

As Endeavour moves to within 35 feet of the OAST-FLYER, Wakata will align the arm with the grapple fixture on the SPARTAN platform, lock onto the satellite, reberth it in the cargo bay and latch it in place for its return to Earth.

SHUTTLE SOLAR BACKSCATTER ULTRAVIOLET (SSBUV)

In late 1989, the Space Shuttle Atlantis carried the first flight of the Goddard Space Flight Center's Shuttle Solar Backscatter Ultraviolet (SSBUV) instrument. Since then, SSBUV has made six additional flights and has become known as Goddard's "frequent flyer." SSBUV is scheduled to fly for the eighth and last time aboard STS-72.

Mission

The SSBUV instrument is designed to measure ozone concentrations by comparing solar ultraviolet radiation with radiation scattered back from the Earth's atmosphere. SSBUV results are compared with the observations of several ozone measuring instruments, both past and present, aboard NASA's Nimbus-7 and the National Oceanic and Atmospheric Administration's (NOAA) NOAA-9, NOAA-11 and NOAA-14 satellites, the Russian Meteor-3/TOMS satellite, NASA's Upper Atmosphere Research Satellite (UARS), and the European Space Agency's ERS-2 satellite, which was launched in April 1995. The SSBUV data are used to calibrate the instruments to ensure the most accurate readings possible for the detection of atmospheric ozone trends.

SSBUV undergoes rigorous calibration before and after flight. Consequently, it provides the best opportunity to help determine the reliability of ozone data gathered by other satellite instruments. The SSBUV uses the Space Shuttle's orbital flight path to assess this performance by the direct comparison of data from identical instruments aboard the NOAA spacecraft as the Space Shuttle and the satellites pass over the same Earth location within an hour. These orbital coincidences can occur 17 times a day.

The NOAA SBUV/2 instrument and NASA's SSBUV instruments estimate the amount and height distribution of ozone in the upper atmosphere by measuring the incident solar ultraviolet radiation and ultraviolet radiation

backscattered from the Earth's atmosphere. The SSBUV measures these parameters in 12 discrete wavelength channels in the ultraviolet. Because ozone absorption is a strong function of wavelength, the ozone column amount and its height distribution can be derived from these measurements.

SSBUV's value lies in its ability to provide highly accurate ozone measurements. The instrument is calibrated to a laboratory standard before flight, then is recalibrated during and after flight to ensure its accuracy. These laboratory standards are calibrated routinely at the National Institute of Standards and Technology. The rigorous calibration has been maintained since the beginning of the SSBUV flight series.

Previous Flights

The seven previous SSBUV flights occurred on STS-34 in October 1989, STS-41 in October 1990, STS-43 in August 1991, STS-45/ATLAS-1 in March 1992, STS-56/ATLAS-2 in April 1993, STS-62 in March 1994, and STS-66/ATLAS-3 in November 1994.

After SSBUV's flight in November 1994, the instrument was checked out at the Kennedy Space Center, FL, to make certain the instrument continued to function properly. The payload was returned to Goddard where the instrument was checked out, recalibrated and re-qualified with plans to return it to Kennedy in early September. Concurrently, data from previous flights were processed and examined by SSBUV scientists and analysts.

Results

SSBUV's impact on NASA's ability to detect ozone trends accurately was realized after four flights. Data from the first flight in combination with information from an earlier satellite already have been used to estimate ozone trends in the upper stratosphere since 1980. These results show a depletion of about eight percent over 10 years, which is consistent with predictions of ozone depletion.

SSBUV has achieved one of its primary objectives using data from the first three flights flown in 1989, 1990 and 1991. These data were used to update the calibration of the NOAA-11 SBUV/2 ozone instrument, which had been operating in orbit since late 1988. The NOAA ozone data have been reprocessed with a refined algorithm and new calibration factors based on SSBUV and SBUV/2 in-flight calibration data. The reprocessing covers the period 1989 to 1993. The reprocessed data have been checked against ground-based ozone observations, and these comparisons show very good agreement. There also is excellent consistency between the refined NOAA-11 SBUV/2 data and the Nimbus-7 SBUV/TOMS data set, which goes back to 1978. The combined 15-year data set represents an excellent resource for ozone climate and trend studies.

SSBUV has detected and verified a significant decrease in the amounts of total Northern Hemisphere ozone levels between the STS-45/ATLAS-1 (March 1992) and STS-56/ATLAS-2 (April 1993) missions. The depletion also was detected simultaneously by satellites and ground-based observations. Indications are that total ozone decreased during the same period on the order of 10 to 15 percent at mid-latitudes in the Northern Hemisphere. Scientists believe that this significant depletion results from the combined residual effects of Mt. Pinatubo aerosols in the stratosphere and cold stratosphere temperatures during the winter of 1992-93 with the by-products of CFC's in the stratosphere.

During the ATLAS-3 mission (SSBUV-7) on STS-66, several coordinated experiments were conducted among the ATLAS and UARS instruments to determine the accuracy of space-borne stratospheric ozone and solar irradiance measurements in the wavelength range important to atmospheric chemistry and climate. The ozone measurements agreed to better than 10 percent while the solar irradiance measurements agreed to better than two percent. These accurate measurements will be the baseline for studies of ozone and solar changes into the next century.

Operation

The SSBUV instrument and its flight support electronics, power, data and command systems are mounted in the Space Shuttle's payload bay in two flight canisters that, together, weigh 900 pounds (410 kilograms). The instrument canister holds the SSBUV instrument, its aspect sensors and in-flight calibration system. Once in orbit, a motorized door assembly opens the canister, allowing the SSBUV to view the Sun and Earth. The canister closes, providing contamination protection, while SSBUV performs in-flight calibrations. The support canister contains the avionics, including the power, data and command systems.

SSBUV obtains power from the Space Shuttle and receives real-time ground commands and data acquisition. This allows enhanced SSBUV data gathering capabilities and an ability to coordinate measurements with NOAA's SBUV/2 and ESA's GOME, as well as the UARS instrument complements. SSBUV command and data acquisition will be conducted from the Payload Operations Control Center (POCC) at the Goddard Space Flight Center.

Ernest Hilsenrath, Goddard Space Flight Center, is the principal investigator, and Joe Cerullo, of the Aerospace Engineering Group of IDEA Inc., is the mission manager. SSBUV is managed by Goddard for NASA's Office of Mission to Planet Earth, Washington, DC.

SHUTTLE LASER ALTIMETER PAYLOAD

The Shuttle Laser Altimeter-01 (SLA-01) is the first of four planned remote sensing flights to precisely measure the distance between the Earth's surface and the Space Shuttle.

The SLA-01 works by transmission of a series of short laser pulses from the payload in the Shuttle cargo bay and by the subsequent reception of weak, laser pulse echoes from the Earth's surface. Primary data will be obtained on each laser pulse's time-of-flight and the pulse distortion and pulse broadening caused by reflection from the Earth's surface. Measurable pulse echoes are expected from land surfaces, vegetation, ocean surfaces, and cloud-tops. Each laser pulse is approximately the size of a football field by the time it strikes the Earth's surface and exactly ten pulses are transmitted each second of SLA-01 operation. Data from the pulse echoes have wide applications in a variety of Earth-science disciplines ranging from topography studies to measurement of tree heights and cloud tops.

The SLA-01 flight has two primary objectives: [1] acquire samples of land topography and vegetation data; and [2] provide an in-space engineering testbed for future space flight laser sensors. The SLA-01 distance measurements will be combined with Space Shuttle orbit and pointing angle analysis electronics, and power conditioning modules for SLA-01. Both payload canisters are filled with inert nitrogen gas and remain pressurized throughout the flight.

The SLA instrument is being developed by Goddard's Laboratory for Terrestrial Physics and is sponsored by NASA Headquarters' Mission to Planet Earth, Flight Systems Division. The payload manager is Jack Bufton of Goddard.

Thermal Energy Storage-2 (TES-2)

The Thermal Energy Storage (TES-2) experiment will fly on a GAS Bridge (Getaway Special Bridge) located in Endeavour's payload bay. The TES-2 payload is designed to provide data for understanding the long duration behavior of thermal energy storage fluoride salts that undergo repeated melting and freezing in microgravity. These salts are used in advanced solar dynamic power systems which use heat to produce electricity.

When the thermal energy salt is melted, it expands approximately thirty percent in volume. As the thermal salt cools, it solidifies and shrinks, thus causing voids or pockets to form in the salt. This void formation affects both the heat absorption rate of the salt and the design of the heat receiver containers holding the salt. Repeated melt/freeze cycles will characterize the void formation and movement of the void in the salt. Consequently,

understanding and predicting the melt/freeze behavior of the salts in the on-orbit environment will lead to an improved design for solar dynamic system heat receivers.

G-342: The Flexible Beam Experiment 2 (FLEXBEAM 2)
Investigator: United States Air Force Academy
NASA Technical Manager: Charles Knapp, Goddard Space Flight Center
Internet address: http://sspp.gsfc.nasa.gov/gas.html

Vibrations in space are a nuisance. Since space is virtually void from any atmosphere, there is no medium to dampen structural oscillations. Oscillations can be dampened by mass and springs, reaction jets, or oscillators. However, what if the reaction jets fail, springs break, or actuators can't fit into the mission? Do we even need dampers? How long will certain materials vibrate in a microgravity, vacuum environment? These are just a few worries for designers of solar arrays and space stations in orbit.

The Flexible Beam Experiment (FLEXBEAM) investigates these questions by exciting two, Aluminum 6061 T-6, cantilevered beams. Each beam is subjected to different initial cotan to solve for the height of the Earth's surface along the ground track of the Space Shuttle. The overall measurement goal is one meter precision in determination of surface height.

The SLA-01 instrument consists of the Laser Altimeter Canister (LAC) and the Altimeter Support Canister (ASC). Both LAC and ASC canisters are separately connected to the Hitchhiker carrier electronics for power, data, and command functions. These two payload modules also are connected to each other for transfer of data and commands between the instrument controller in the ASC and the laser sensor in the LAC. The LAC is equipped with a Motorized Door Assembly and a large optical window. The door is opened only on orbit to permit laser transmission and detection through the window. The LAC contains a laser pulse transmitter and a concave mirror and detector which collects each laser pulse echo and converts it to an electronic pulse that can be analyzed. The ASC contains the instrument computer, pulse timing and shape analysis electronics resulting in exciting, different modes. Electromagnetic sensors measure the vibrations with the data being stored in a recorder.

After the FLEXBEAM is flown aboard Endeavour, the data will be modeled as a finite element analysis. From these data, the U.S. Air Force Academy hopes to represent other beam vibrations, and to analyze and predict other vibrational responses. Furthermore, the data obtained in space will be compared to previously recorded data from an Earthbound control experiment.

G-459: Protein Crystal Growth
Investigator: The Society of Japanese Aerospace Companies, Inc.
NASA Technical Manager: Charles Knapp, Goddard Space Flight Center
Internet address: http://sspp.gsfc.nasa.gov/gas.html

It is well known that the microgravity environment is suitable to make well-ordered protein crystals for X-ray diffraction analysis and three-dimensional structure determination. But, it is still unclear why microgravity is effective. In our previous microgravity experiments, we have evidence that nucleation provability of crystal forms and X-ray resolution (index of crystal order) are affected by microgravity.

In the G-459 payload, we will re-examine the effect of the microgravity environment on protein-crystal nucleation. Crystal form and size will be recorded on photographic film and analyzed after recovery of the G-459 payload. For the experiment, we have developed a hardware system to adapt to a GAS payload canister. In the system, 16 independent crystallization units are used. Each of the units can carry out crystallization experiments by one of three crystallization methods, i.e., batch, vapor diffusion, and free-interface diffusion.

The unit has two compartments: one for protein solution and the other for solution to archive salting of protein. These compartments are separated from each other by thick acrylic or thin stainless-steel plate. The crystallization process will be started by sliding out the plates linked to a triangular plate which is pulled up by ball screws and a stepping motor. A 35-mm camera will record images of crystals grown in the units for up to 120 hours.

Horse heart myoglobin and bovine pancreatic ribonuclease S will be used in the experiment. The former makes brownish colored crystals which are easy to observe and the latter shows polymorphism of crystals. Our previous microgravity experiments show nucleation provability of crystal forms is affected by microgravity, i.e., convectionless environment. We will observe which type of crystal forms is preferentially grown in the G-459 experiment.

GAS Ballast Can with Sample Return Experiment
Investigator: Peter Tsou, Jet Propulsion Laboratory, California

The ballast can has the Sample Return Experiment on the top of the canister which collects cosmic particles. Ballast payloads are flown when circumstances preclude a manifested GAS experiment from a mission and no replacement payload is readily available.

EXTRAVEHICULAR ACTIVITY DEVELOPMENT FLIGHT TEST-03 (EDFT-3)

During STS-72, two spacewalks will be performed with a total of three crew members taking part during the mission.

The Extravehicular Activities (EVAs) are part of a continuing series of spacewalks being done in preparation for the orbital construction of the international Space Station. The STS-72 spacewalks will evaluate tools, techniques and equipment involved in the planned space construction work; build spacewalking experience among the astronaut corps; and refine ground training methods for spacewalks. The STS-72 spacewalk evaluations are called the EVA Development Flight Test-3 (EDFT-3) and encompass a variety of Detailed Test Objectives.

The first spacewalk, planned to last six and a half hours, will be performed on Flight Day 5 by Mission Specialists Leroy Chiao, designated Extravehicular Crewmember 1 (EV1) and Daniel Barry, designated EV2. The second spacewalk, also six and a half hours, is planned for Flight Day 7 and will be performed by Chiao as EV1 and Mission Specialist Winston Scott as EV3. Three spacesuits will be aboard Endeavour, one fitted for each EV crew member.

During the first spacewalk, Scott will serve as the Intravehicular (IV) crewmember, serving as a coordinator for the EVA work from within Endeavour's crew cabin. Pilot Brent Jett will operate Endeavour's mechanical arm, which will be used during the spacewalk evaluations. For the second spacewalk, Barry will serve as the IV crew member while Jett again operates the mechanical arm.

On the first spacewalk, Chiao and Barry will conduct evaluations of a new Portable Work Platform (PWP), an EVA workstation for astronauts that provides an aid for temporarily restraining replacement units and equipment the spacewalker may be working with; a movable stanchion that provides stability for the astronaut and holders for tools; and a flexible foot restraint flown on previous Shuttle missions. They also will evaluate the installation of a rigid umbilical that may be used on the space station to hold various fluid and electrical umbilicals in place. The Rigid Umbilical (RU), which weighs almost 250 pounds, also will be used for evaluations of the handling of large masses while spacewalking.

The second spacewalk, conducted by Chiao and Scott, will consist mainly of evaluations of a space station Utility Box, a box designed to hold avionics and fluid line connections on the station; an on-orbit installed slidewire, a type of wire to which EVA tethers can be connected that is planned to be installed on the exterior of the space station in orbit; measurements of forces induced by various spacewalking work such as replacing station components and manipulating massive objects; and an evaluation of thermal improvements to the spacesuits.

In addition, an Electronic Cuff Checklist (ECC), a wrist-mounted portable computer planned to supplement written checklists for spacewalks, will be evaluated. The ECC will be making its fourth Shuttle flight on STS-72.

Detailed descriptions of the test equipment and evaluations include:

Portable Work Platform

The PWP is a mobile EVA worksite designed for the end of the International Space Station's mechanical arm being flight-tested for the first time on STS-72. Somewhat similar to the work platform used at the end of the Shuttle arm during past spacewalks -- such as those to service the Hubble Space Telescope on STS-61 -- the PWP offers greater flexibility of movement with a swiveling foot restraint; a storage location for tools and a temporary storage location for large space station Orbital Replacement Units (ORUs). The PWP is composed of an Articulating Portable Foot Restraint, a foot platform for spacewalkers that can be swiveled to various orientations using two foot pedals, allowing a spacewalker to reposition without dismounting from it; a Portable Foot Restraint Work Stanchion that can hold tools and equipment; and a Temporary Equipment Restraint Aid that is designed to hold large ORUs. Crewmembers will evaluate the PWP by using it mounted at the end of Endeavour's mechanical arm to perform several other tasks planned during the spacewalks.

Rigid Umbilical

The RU simulates an umbilical designed to link space station modules to the truss structure and to other modules. It simulates a type of cable tray holding a variety of avionics and fluid lines that will run between the various station structures. Exactly as is planned during station construction, the RU is launched folded and will be unfolded during the STS-72 EVA to its full 17.5-foot length. A crewman in the PWP on the mechanical arm will detach the eight-foot long folded RU from the left side of the cargo bay and mate one end to a connector on the left side of the bay, called the Port Rigid Umbilical Mount. The crew then will unfold the RU and mate the other end to a connector on the right side of the bay. Five electrical connections and two fluid line connections will be performed at the right end, simulating the work planned for the station. The connections are actual station components, but carry no electricity or fluid. In addition, several partial unfolding evaluations of the RU will be performed, simulating various positions planned for the attachment on the space station. The RU also will be used for mass handling evaluations during the spacewalk to simulate the characteristics of moving large station ORUs in weightlessness. The RU is being flight-tested for the first time on STS-72.

Utility Box

Located on the left side of Endeavour's cargo bay, the Utility Box simulates similar boxes planned to house connections of fluid lines and avionics lines on segments of the Space Station truss structure. The crew will connect nine electrical connectors and three fluid line connectors of varying sizes. Several design variations, such as stiffness of cables, retaining clamps for cables and the size of fluid lines are built into the box to be evaluated by the crew. The crew also will evaluate using a variety of methods to restrain themselves while working. The lines and connections are actual station hardware, but carry no electricity or fluid.

Cable Caddy

The Cable Caddy is a small carrier device planned to hold replacement electrical line for the Space Station. During the spacewalk, the crew will simulate running a replacement line by unrolling 20 feet of cable from the device and making connections at each end.

On-Orbit Installed Slidewire

The On-Orbit Installed Slidewire is a wire to be used for attaching EVA tethers while moving from one location to another, similar to permanently mounted wires running down the sides of the Shuttle's cargo bay that serve the same purpose. Several slidewires will be installed on the exterior of station segments after the sections have been launched, allowing the exterior of the segments to have fewer protrusions during launch and be more compact. To install the wire, the crew will unclip it from its holder, attach one end to a special attachment fitting in the cargo bay, unwind the wire and attach the other end to a similar fitting, and adjust a bolt that will tighten the wire.

Spacesuit Thermal Modifications

Thermal improvements to the spacesuits first tested on Shuttle mission STS-69 are again being evaluated on STS-72. However, on STS-72, the crewmember will not be at the end of the mechanical arm for the evaluations but rather in a foot restraint mounted inside the cargo bay. The crew will maneuver the Shuttle to an orientation that provides temperatures similar to the previous tests, ranging as low as minus 135 degrees Fahrenheit. Such cold conditions are expected during some construction work on the International Space Station due to its planned orientation in orbit.

The spacesuit modifications include gloves with electrically warmed fingers. The heating elements, powered by battery packs mounted above the wrists, are located on the back of the fingertips and do not impede the dexterity available with the gloves. Thermal socks, thermal toe caps inserted in the spacesuit boots, and new, adjustable thermal mittens that can fit over the spacesuit gloves

also will be worn. In addition, the spacesuits allow a spacewalker to completely shut off cooling water to the Liquid Cooling and Ventilation Garment, thus providing maximum warmth.

Body Restraint Tether

A Body Restraint Tether (BRT), designed to hold a spacewalker steady when clamped to a handrail, was first flown on STS-69 but will be further evaluated on STS-72. The BRT is planned to provide a quick method of supplying stability for a spacewalker in a variety of locations where a foot restraint is not available. The tether essentially seeks to provide the astronaut with a third hand to add stability while working. On STS-72, it will be one method of restraint used during the evaluation of the Utility Box; it also will provide stability for the crew during assembly of the PWP.

Rigid Tether

The Rigid Tether, a device flown on two previous Shuttle flights, also will be further evaluated during STS-72. The Rigid Tether is used to allow astronauts to more easily carry large objects, such as a foot restraint, with them while they move from site to site. It hooks the equipment to their spacesuit and prevents it from swinging about.

On-Orbit Installed Handrail

The On-Orbit Installed Handrail is designed for installation on the exterior of the Space Station. It was flown previously on STS-69 and will be further tested during STS-72. It is secured by two sliding latches that will lock it into position.

Caution and Warning Labeling

Several of the designs planned for warning labels to be mounted on the exterior of the space station will be evaluated during STS-72. The caution labels are affixed to the exterior of equipment boxes to be used during the EVAs.

NIH-R3

NIH-R3 is a collaborative project developed by NASA and the National Institutes of Health (NIH). This study will use microgravity as a research tool to understand early development. This research is the beginning of experiments proposed for the 1998 Shuttle Neurolab mission. This test is essential because nursing neonatal rats with adult female rats or dams have not been flown previously in space, and healthy neonates and dams are essential for future space flight developmental studies.

The first three weeks of life are a period of tremendous development for newborn rats. The animals are transformed from small newborns focused on obtaining nourishment from their mother into young independent rats. The nervous system undergoes dramatic development during this period. Understanding how this development occurs in rats will give great insight into how normal neurological development occurs on Earth.

The rats will be housed in a modified Animal Enclosure Module system, called the AEM-Nursing Facility, which was designed to support nursing rats and neonates. The three nursing facilities each will house two adult lactating female rats, (each female will fly with a litter of 10 neonates).

The animal module flies in a middeck locker in the Shuttle and provides food and water, airflow, air filtration, light-dark cycles, temperature recording, and odor and waste containment systems.

Another goal of this hardware demonstration flight experiment is to validate the suitability of space-flown lactating female rats and neonates for research planned for Neurolab. Two of the Neurolab principal investigators (Dr. Danny Riley, Medical College of Wisconsin, and Dr. Kerri Walton, New York University) will perform post-flight analysis of animals to begin the planned Neurolab experiments.

The goal of Riley's study is to understand the influence of gravity on spinal cord and muscle development of terrestrial mammals, including humans.

Walton will use behavioral measures as a tool in examining the influence of the environment on the postnatal development of specific and critical brain/body systems. Gravity provides an ideal model since it is perhaps the only factor that has been present throughout evolution and can be altered in a non-invasive way.

For NIH-R3, rats will experience weightlessness at three ages, postnatal days 5 to 14, 8 to 17 and 15 to 24. This will allow evaluation of three overlapping periods of development; two groups of rats will experience their "sensitive" period and the eldest group will experience the final period of vestibular system development in the near weightlessness of microgravity.

Since all their major systems (nervous, muscular, cardiovascular, respiratory, renal, gastrointestinal and mineral metabolism) are rapidly developing, neonate rats are much more sensitive than adult rats to changes in gravity. Thus, for young rats, days spent under conditions of microgravity during a critical period of development is probably the equivalent of months of exposure for an adult.

NIH.C5

The NIH.C5 experiment continues the collaboration between NASA and the NIH. It is a middeck-locker experiment that will repeat and augment previously flown experiments investigating the effect of spaceflight on musculoskeletal development at the cellular level.

The experiment payload consists of two biomedical studies sponsored by NASA and NIH. These experiments will use a computerized tissue culture incubator known as the Space Tissue Loss Culture Module. The module was developed at the Walter Reed Army Institute of Research, Washington, DC, to study cells in microgravity.

The experiments will study the effects of space flight on muscle and bone cells from chicken embryos. The experiments on STS-72 will augment data from the flight of the module in November 1994. Results of this research may lead to development of measures to maintain the strength of muscles and bones during long-duration space voyages and possibly on Earth.

The scientific objectives of the NASA/NIH collaboration are to investigate fundamental biological processes governing cell action, independent of the effects of gravity, and to study the effects of microgravity on the cellular functions of both muscle and bone cells. Dr. Adele Boskey of the Hospital for Special Surgery in New York will examine the effects of space flight on calcification and cellular activity in maturing cartilage cells.

Dr. Herman Vandenburgh of the Miriam Hospital and Brown University will study the effects of space flight on muscles to determine if microgravity induces damage or loss of muscle fibers using special markers of cell damage, growth assays, measurements of muscle size and multiple biochemical assessments.

PROTEIN CRYSTAL GROWTH (PCG)

Principal Investigator:
Dr. Larry DeLucas
University of Alabama at Birmingham

STS-72 will introduce an enhanced version of the Protein Crystal Growth Vapor Diffusion Apparatus. The original apparatus has been used for over 20 Shuttle experiments and has been successful in producing highly ordered crystals of selected proteins for analysis on Earth. The second-generation apparatus is designed to improve the mixing of experiment solutions, especially certain solutions which are too viscous to be adequately mixed in the original hardware. Better mixing is expected to result in the formation of larger, higher quality protein crystals.

The new design introduces a triple-barreled syringe, which replaces the double-barreled syringe of the original apparatus, to improve mixing of experiment solutions. On STS-72, four apparatus trays will be housed in a single-locker thermal enclosure system installed in place of a Shuttle middeck locker. Each tray contains 20 experiment chambers, for a total of 80 chambers. Candidate proteins for the protein crystal growth experiment on STS-72 are under review.

Proteins are important, complex biological substances which serve a variety of functions in all living organisms. Determining the three-dimensional structures of protein molecules leads to a greater understanding of how various proteins function in plants and animals. This knowledge also provides the potential for design of better agricultural products and new pharmaceuticals to treat a wide variety of diseases and disorders. Since the specific functions of essentially all biological molecules are determined by their three-dimensional structures, growing crystals of those proteins for structural analysis plays a central role in all the biomedical sciences.

Crystals produced in the gravity environment of Earth are often too small and may have internal defects that make crystallographic analysis difficult or impossible. As demonstrated on Space Shuttle missions since 1985, some protein crystals grown in space are not only larger, but also have fewer defects than their Earth-grown counterparts. This is because crystals produced in microgravity do not settle to the bottom of the growth solution droplets and clump together -- and because fluid flows, which can cause defects in growing protein crystals on Earth, are reduced in low gravity.

A number of protein structures have been defined using space grown crystals to a significantly higher resolution than can be obtained with their Earth-grown counterparts. In addition, these space experiments promote a better understanding of the fundamentals of crystal growth phenomena.

Commercial Protein Crystal Growth - 8 (CPCG-8)

The CPCG payload to be flown on STS-72 will be a protein crystal growth experiment using batch temperature-induction crystallization methodology to produce crystals of a new form of recombinant human insulin. Temperature induction allows protein saturation and subsequent crystal growth to proceed slowly in a predetermined manner in order to maximize crystal size and quality. This methodology is particularly effective in space because, in the unique environment of microgravity, disruptive convection currents resulting from temperature change are minimized.

One objective of this flight is to fly protein sample containers of different volumes and geometries in order to investigate the effect of various temperature gradients on protein crystal growth in microgravity. A part of that objective is to test containers of volumes smaller than the current smallest volume of 50 milliliters. These smaller volumes should make this space processing flight hardware more attractive to industry partners and academic collaborators who are limited in the amount of protein available for their microgravity programs. Smaller volumes provide an opportunity to test a relatively large number of samples rather than the four currently possible in one Shuttle middeck locker. It is expected that this new hardware will provide greater flexibility in temperature gradients and sample sizes.

The protein sample to be processed on the first flight of this new hardware will be a new form of recombinant human insulin whose parent molecule, insulin, is used for the treatment of type I diabetes ("juvenile-onset"). The microgravity grown crystals will be used for X-ray diffraction studies and refined structural determination to facilitate the ability of the corporate partner, Eli Lilly, to understand the mode of action of this new form of insulin.

STS-72 CREW BIOGRAPHIES

BRIAN DUFFY (Colonel, USAF)

Birthplace and date:
Born June 20, 1953, in Boston, MA. His mother, Mrs. Anne C. Duffy, resides in Hingham, MA. His father, Mr. Daniel E. Duffy, is deceased.

Physical description:
Brown hair; brown eyes; 6 feet; 175 pounds.

Education:
Graduated from Rockland High School, Rockland, MA, in 1971; received a bachelor of science degree in mathematics from the U.S. Air Force (USAF) Academy in 1975, and a master of science degree in systems management from the University of Southern California in 1981.

Marital status:
Married to the former Janet M. Helms of West Lafayette, IN. Her parents, Mr. & Mrs. John J. Helms, reside in Ft. Myers, FL.

Children:
Shaun Patrick, Jan. 25, 1981; Shannon Marie, Nov. 3, 1982.

NASA experience:
Selected by NASA in June 1985, Duffy became an astronaut in July 1986. Since then, he has participated in the development and testing of computer software to be used on Shuttle flights, served as Technical Assistant to the Director of Flight Crew Operations, developed displays and flight crew procedures used during the ascent phase, served as spacecraft communicator (CAPCOM) in Mission Control during numerous Space Shuttle missions, and also worked on Space Station issues. A veteran of two space flights, he has logged over 453 hours in space. Duffy was the pilot on STS-45 (March 24 to April 2, 1992), the first of the ATLAS series of missions to address the atmosphere and its interaction with the Sun. He also was the pilot on STS-57 (June 21 to July 1, 1993). Mission highlights included retrieval of the European Retrievable Carrier with the Shuttle's robotic arm, a spacewalk by two crew members, and an assortment of experiments in the first flight of the Spacehab middeck augmentation module.

BRENT W. JETT, JR. (Lieutenant Commander, USN)

Birthplace and date:
Born Oct. 5, 1958, in Pontiac, MI, but considers Ft. Lauderdale, FL, to be his hometown. His parents, Mr. & Mrs. Brent W. Jett, Sr., reside in Ft. Lauderdale, FL.

Physical description:
Blond hair; green eyes; 6 feet 1-1/2 inches; 165 pounds.

Education:
Graduated from Northeast High School, Oakland Park, FL, in 1976; received a bachelor of science degree in aerospace engineering from the U.S. Naval Academy in 1981; a master of science degree in aeronautical engineering from the U.S. Naval Postgraduate School in 1989.

Marital status:
Married to Janet Leigh Lyon of Patuxent River, MD. Her mother, Mrs. Mary Patricia Lyon, resides in Fredericksburg, VA. Her father, Mr. James Richard Lyon, Sr., is deceased.

NASA experience:
Selected by NASA in March 1992, Jett reported to the Johnson Space Center in August 1992. After completing one year of initial training, Jett was assigned to work technical issues for the Operations Development Branch of the Astronaut Office. He later served as the ascent/entry CAPCOM in Mission Control for STS-64 and STS-63.

LEROY CHIAO (Ph.D.)

Birthplace and date:
Born Aug. 28, 1960, in Milwaukee, WI, but considers Danville, CA, to be his hometown. His parents, Mr. & Mrs. Tsu Tao Chiao, reside in Fairfield, CA.

Physical description:
Black hair; brown eyes; 5 feet 8 inches; 170 pounds.

Education:
Graduated from Monte Vista High School, Danville, CA, in 1978; received a bachelor of science degree in chemical engineering from the University of California, Berkeley, in 1983, and a master of science degree and a doctorate in chemical engineering from the University of California, Santa Barbara, in 1985 and 1987, respectively.

Marital status:
Single.

NASA experience:
Selected by NASA in January 1990, Dr. Chiao became an astronaut in July 1991. He is qualified for assignment as a mission specialist on future Space Shuttle flight crews. His technical assignments to date include: Space Shuttle flight software verification in the Shuttle Avionics Integration Laboratory (SAIL); crew equipment, Spacelab, Spacehab and payloads issues for the Astronaut Office Mission Development Branch; Training and Flight Data File issues.

Dr. Chiao served as a mission specialist on STS-65. The seven-member crew aboard Space Shuttle Columbia launched from Kennedy Space Center in Florida on July 8, 1994, and returned there on July 23, 1994, setting a new flight duration record for the Space Shuttle program. The STS-65 mission flew the second International Microgravity Laboratory (IML-2). During the 15-day flight, the crew conducted more than 80 experiments focusing on materials and life sciences research in microgravity. The mission was accomplished in 236 orbits of the Earth, traveling 6.1 million miles. With the completion of his first mission, Dr. Chiao has logged 353 hours and 55 minutes in space.

WINSTON E. SCOTT (Captain, USN)

Birthplace and date:
Born Aug. 6, 1950, in Miami, FL. His father, Alston Scott, resides in Miami, FL. His mother, Rubye Scott, is deceased.

Physical description:
Black hair; brown eyes; 6 feet 1 inch; 165 pounds.

Education:
Graduated from Coral Gables High School, Coral Gables, FL, in 1968; received a bachelor of arts degree in music from Florida State University in 1972; a master of science degree in aeronautical engineering from the U.S. Naval Postgraduate School in 1980.

Marital status:
Married to the former Marilyn K. Robinson. Her parents, Albert and Josephine Robinson, reside in Chipley, FL.

Children:
Winston II, March 13, 1976; Megan, Aug. 21, 1978.

NASA experience:
Scott was selected by NASA in March 1992, and reported to the Johnson Space Center in August 1992. He was initially assigned to the Astronaut Office Mission Support Branch, serving with the Astronaut Support Personnel team supporting Space Shuttle launches and landings at the Kennedy Space Center in Florida.

KOICHI WAKATA (NASDA)

Birthplace and date:
Born Aug. 1, 1963, in Omiya, Saitama, Japan. His parents, Mr. and Mrs. Nobutaka Wakata, are residents of Omiya, Saitama, Japan.

Physical description:
Black hair; brown eyes; 5 feet 7 inches; 138 pounds.

Education:
Graduated from Urawa High School, Saitama, in 1982; received a bachelor of science degree in aeronautical engineering from Kyushu University in 1987; and a master of science degree in applied mechanics from Kyushu University in 1989.

Marital status:
Single.

NASA experience:
Selected by NASDA, the National Space Development Agency of Japan, in April 1992, Wakata reported to the Johnson Space Center in August 1992. He completed one year of training and is qualified for assignment as a mission specialist on future Space Shuttle flight crews. Wakata's technical assignments to date include: payload science support for the Astronaut Office Mission Development Branch (April 1993 to date); Space Shuttle flight software verification testing in the Shuttle Avionics Integration Laboratory (SAIL) (April to October 1994).

DANIEL T. BARRY (M.D., Ph.D.)

Birthplace and date:
Born Dec. 30, 1953, in Norwalk, CT, but considers South Hadley, MA, to be his hometown. His mother, Mrs. Albeus E. Barry, resides in Catonsville, MD.

Physical description:
Brown hair; green eyes; 6 feet 3 inches; 175 pounds.

Education:
Graduated from Bolton High School, Alexandria, LA, in 1971; received a bachelor of science degree in electrical engineering from Cornell University in 1975; a master of engineering degree and a master of arts degree in electrical engineering/computer science from Princeton University in 1977; a doctorate in electrical engineering/computer science from Princeton University in 1980; and a doctorate in medicine from the University of Miami in 1982.

Marital status:
Married to the former Susan R. Feinstein. Her parents, Mr. & Mrs. Malcolm Feinstein, reside in Stamford, CT.

Children:
Jennifer and Andrew.

NASA experience:
Selected by NASA in March 1992, Dr. Barry reported to the Johnson Space Center in August 1992. He completed one year of training and is qualified for assignment as a mission specialist on future Space Shuttle flight crews. Dr.

Barry initially worked on primary payloads for the Mission Development Branch of the Astronaut Office. Other assignments included work in the Shuttle Avionics Integration Laboratory (SAIL), portable computing issues for Space Shuttle, and Chief of Astronaut Appearances.

News Release

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For Release
December 5, 1995

NOTE TO EDITORS: N95-80

PRE-FLIGHT BRIEFINGS SET FOR SPACE SHUTTLE MISSION STS-72

NASA's first Space Shuttle mission of 1996 will be the focus of briefings on Dec. 14 and 15 at the Johnson Space Center, Houston, TX, the Goddard Space Flight Center, Greenbelt, MD, and the Marshall Space Flight Center, Huntsville, AL.

Space Shuttle Endeavour is scheduled for launch on January 11 on a nine-day flight to retrieve the Japanese Space Flyer Unit, which was launched March 18th aboard a Japanese H-2 rocket to conduct a variety of microgravity experiments. Endeavour also will deploy the OAST-Flyer which will fly free of the Shuttle for approximately 50 hours. The satellite, developed by NASA's Office of Aeronautics and Space Technology, will have four experiments on the science platform that will operate autonomously before the satellite is retrieved by Endeavour's robot arm.

In addition, three of Endeavour's six astronauts will conduct a pair of spacewalks to test hardware and tools which will be used in the assembly of the International Space Station starting in late 1997.

Briefings will begin at 9 a.m. EST on Dec.14 at Johnson with a mission overview. Another briefing will follow at 10 a.m. on the Space Flyer Unit and at 11 a.m. with a briefing on the OAST-Flyer from Goddard. At 12:30 p.m., a briefing on a NASA/NIH experiment will be held at Johnson, followed by two briefings at 1 p.m. and 1:30 p.m. from Goddard on the Shuttle Solar Backscatter Ultraviolet Experiment and the Getaway Specials flying on the mission. The final briefing will take place at Marshall at 2 p.m. involving the STS-72 Commercial Protein Crystal Growth Experiment.

A briefing on the two spacewalks will be held at 12:30 p.m. EST on Dec. 15, at Johnson followed at 2 p.m. with the crew news conference involving all six astronauts, including Koichi Wakata, a Japanese astronaut representing NASDA. Wakata will be serving as a NASA mission specialist.

- more -

The following is the briefing schedule (all times are EST):

Dec. 14, 1995

9 a.m.	Mission Overview (originating from Johnson) Bryan Austin, STS-72 Lead Flight Director
10 a.m.	Space Flyer Unit Briefing (originating from Johnson)
11 a.m.	OAST-Flyer Briefing (originating from Goddard)
12:30 p.m.	NASA/National Institutes of Health (NIH) Experiment Briefing (originating from Johnson)
1 p.m.	Shuttle Solar Backscatter Ultraviolet Experiment (originating from Goddard)
1:30 p.m.	Getaway Special Briefing (originating from Goddard)
2 p.m.	Commercial Protein Crystal Growth Experiment (originating from Marshall)

Dec. 15, 1995

12:30 p.m.	EVA Briefing (originating from Johnson)
2 p.m.	STS-72 Crew News Conference (originating from Johnson)

All of the briefings will be carried live on NASA Television with two-way question and answer capability from participating NASA locations. NASA Television is located on Spacenet 2, Transponder 5, Channel 9 at 69 degrees West Longitude. The transponder frequency is 3880 Mhz and the audio subcarrier is 6.8 Mhz. Polarization is horizontal.

-end-

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News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

Sarah Keegan
Headquarters, Washington, DC
(Phone: 202/358-1717)

For Release
December 6, 1995

NOTE TO EDITORS: N95-81

NASA ADMINISTRATOR'S SEMINAR SCHEDULED

"The Plasma Universe," the next in a series of seminars to help shape a unified agenda for the future of NASA's space program will be held at 3 p.m. EST, on Monday, Dec. 11 in NASA's west lobby auditorium, 300 E St., SW, Washington, DC.

Dr. James Van Allen, University of Iowa; Dr. Ian Axford, Max-Planck Institute for Astronomy; and Dr. Roger Blandford, California Institute of Technology will describe how measurements of particles and fields within our local space plasma have led to new understandings of the Sun/Earth connection, the environments that envelop the planets, and the exotic behaviors of cosmic objects such as supernova remnants, pulsars, and quasars.

The seminar series, initiated by NASA Chief Scientist Dr. France Anne Cordova and introduced by NASA Administrator Daniel S. Goldin, will continue over the next year and will consider fundamental questions that bear on NASA's greatest challenges.

Media representatives who wish to cover the event with cameras should call 202/358-1902 by 1 p.m. on Dec. 11.

-end-

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

December 6, 1995

VIDEO ADVISORY: V95-171

LIVE GALILEO MISSION COVERAGE THURSDAY

On Thursday NASA Television will provide live mission coverage of the Galileo Probe's entry and descent into Jupiter's atmosphere starting with an arrival day press briefing at 4 p.m. EST. Live mission commentary from the Jet Propulsion Lab (JPL), Pasadena, CA, will begin at 5:30 p.m. EST. A post Probe entry press briefing will be held at 9:45 p.m. EST from JPL.

GALILEO PROBE ENTRY TIMELINE FOR THURSDAY (ALL TIMES EST):

4 p.m. ARRIVAL DAY PRESS BRIEFING

5 p.m. LIVE MISSION COMMENTARY BEGINS

5:56 p.m. PROBE ENTRY INTO JUPITER'S ATMOSPHERE

6:05 p.m. PROBE MISSION STATUS

8:19 p.m. JUPITER ORBIT INSERTION MANEUVER

9:07 p.m. JUPITER ORBIT INSERTION CONFIRMATION

9:30 p.m. MISSION STATUS BRIEFING

9:35 p.m. GALILEO VIDEO HIGHLIGHT REPLAY

9:45 p.m. POST PROBE ENTRY AND JUPITER ORBIT INSERTION BRIEFING

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

Video Advisory

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

December 7, 1995

REPLAY OF GALILEO POST-PROBE INSERTION BRIEFING ON NTV

In addition to the scheduled features on the upcoming launch of the X-ray Timing Explorer spacecraft, NASA TV will replay excerpts from last night's Galileo Probe post-insertion press briefing that occured at the Jet Propulsion Laboratory, Pasadena, CA. NTV also will replay animation showing the sequence that occured during the successful Probe deploy.

Video news files are aired at noon, 3, 6, and 9 p.m. EST.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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Video Advisory

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
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December 7, 1995

VIDEO ADVISORY: V95-172

XTE SPACECRAFT SET FOR LAUNCH SUNDAY

Friday's NASA Television video news file will provide background animation and footage discussing the upcoming launch of NASA's X-ray Timing Explorer (XTE), a spacecraft that will study stellar black holes, neutron stars and quasars. XTE will perform X-ray timing studies of cosmic sources on time scales ranging from microseconds to years. XTE is set for launch this Sunday morning at 9:38 a.m. EST aboard a Delta II rocket from the Kennedy Space Center, FL. XTE will have an 81 minute window of launch opportunity on Sunday.

ITEM #1: X-RAY OF THE UNIVERSE
Animation of XTE mission

ITEM #2: X-RAY EXPLORER READY FOR LAUNCH
XTE ready for Sunday's launch from the Kennedy Space Center, FL.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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Contract Announcement

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

Ed Campion
Headquarters, Washington, DC
(Phone: 202/358-1778)

December 11, 1995

Lisa Malone
Kennedy Space Center, FL
(Phone: 407/867-2468)

RELEASE: C95-s

KSC EXTENDS MCDONNELL DOUGLAS PAYLOAD CONTRACT

NASA's Kennedy Space Center, FL, has awarded McDonnell Douglas Aerospace, Space & Defense Systems, a one-year extension to its existing contract for payload ground operations services. The value of this option is $152 million.

This extension is effective Jan. 1, 1996, and ends Dec. 31, 1996. This contract features options that will carry the contract period of performance through Dec. 31, 2001, and will bring the total contract value to $2.2 billion.

This is the third extension of the payload ground operations contract awarded to McDonnell Douglas since the original contract was initiated in January 1987.

Under the cost-plus-award-fee contract, McDonnell Douglas will continue to provide ground support, test and integration for payload operations at the Kennedy Space Center.

-end-

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Video Advisory

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Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

December 12, 1995

VIDEO ADVISORY: V95-173

KUIPER AIRBORNE OBSERVATORY RETROSPECTIVE ON NTV

Tuesday's NASA Television video news file will provide a feature piece and interviews on the history of NASA's Kuiper Airborne Observatory, a Lockheed C141A that NASA is retiring. The Kuiper has been used to study astronomy and provide educators with hands-on experience in conducting astronomical scientific investigation from the air. The Kuiper has been in operation, providing an ideal flying platform from which to conduct infrared astronomy, for almost 22 years. Plans call for the facility's ultimate replacement by the new Stratospheric Observatory for Infrared Astronomy (SOFIA), currently moving through the Congressional funding process.

ITEM #1: KUIPER AIRBORNE OBSERVATORY TO RETIRE
A retrospective video celebrating the Kuiper Airborne Observatory.

ITEM #2: INTERVIEW -- WENDY WHITING, MISSION DIRECTOR
Whiting discusses the impact of retiring the Kuiper.

ITEM #3: INTERVIEW -- DR. DIANE WOODEN, AMES RESEARCH CENTER
Wooden discusses how the Kuiper helped study Supernova 1987A.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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Video Advisory

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

David E. Steitz
Headquarters, Washington, DC
(Phone: 202/358-1730)

For Release

December 13, 1995

VIDEO ADVISORY: V95-174

STS-72 MISSION PREFLIGHT BRIEFINGS ON NTV THURSDAY

On Thursday NASA Television will air live preflight briefings for the upcoming STS-72 Space Shuttle mission, set for launch January 11 from the Kennedy Space Center, FL. Space Shuttle Endeavour and a six person crew will retrieve a Japanese satellite that has been conducting microgravity experiments since it's launch aboard a Japanese rocket last March, deploy and retrieve a NASA science satellite and conduct two spacewalks to demonstrate and evaluate techniques to be used in the assembly of the International Space Station.

During Thursday's video news file NASA TV will replay features on NASA's Kuiper Airborne Observatory, a Lockheed C141A that NASA is retiring. *Video news files air each day at noon, 3, 6 and 9 p.m. EST.*

STS-72 BRIEFING SCHEDULE (ALL TIMES EST):

9 a.m.	**STS-72 Mission Overview**
10 a.m.	**Japanese Space Flyer Unit Briefing**
11 a.m.	**NASA OAST-Flyer Satellite Briefing**
Noon	**VIDEO NEWS FILE; replays of the Kuiper retirement features**
12:30	**STS-72 NIH Experiment Briefing**
1 p.m.	**Shuttle Solar Backscatter Ultra-Violet Experiment Briefing**
1:15 p.m.	**STS-72 Get Away Special Experiments Briefing**
2 p.m.	**STS-72 Commercial Protein Crystal Growth Briefing**

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

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Internet Advisory

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

December 14, 1995

Michael Braukus
Headquarters, Washington, DC
(Phone: 202/358-1979)

Robert Mehnert
National Library of Medicine, Bethesda, MD
(Phone: 301/496-6308)

INTERNET ADVISORY: I95-17

SPACE LIFE SCIENCES DATABASE GOES ON-LINE

NASA and the National Library of Medicine have made available on the Internet a jointly developed database of space life sciences research dating from 1961 to the present.

The database, called SPACELINE, was designed by NASA's Office of Life and Microgravity Sciences and Applications and the National Institutes of Health's National Library of Medicine (NLM) to consolidate the results of the growing amount of space life sciences research into a single, easily accessible resource.

SPACELINE contains results of ground-based and flight research. Its references pertain to the health and productivity of humans in space, the physical and psychological effects of gravity and the space environment on living systems and the applications of space life sciences research and exobiology. The types of publications include journal articles, technical reports, books, book chapters, meeting papers and meeting abstracts.

Much of SPACELINE's contents are derived from several of NLM's databases. NLM is internationally known for providing accessible on-line databases in the biomedical sciences. A unique feature of SPACELINE is the space flight mission field which allows experiments conducted on any NASA space mission to be found.

The SPACELINE project, which is just one of several NASA-NIH cooperative activities, developed as a result of NASA's efforts to disseminate information on space life sciences research and lay the foundation for research on the International Space Station.

-more-

SPACELINE can be accessed via modem or the Internet. There is a nominal fee for use of this service. The charge is a result of Congressional direction to offset the cost of the service. The database can be searched either directly using NLM command language or through Grateful Med, NLM's user-friendly software package.

To request a brochure or to obtain additional information about SPACELINE, contact: SPACELINE, Department of Physiology, USUHS, 4301 Jones Bridge Road, Bethesda, MD 20814-4799 (phone: 301/295-2482; fax: 301/295-5271) or e-mail: SPACELINE@usuhsb.usuhs.mil

- end -

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News Release

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

Douglas Isbell
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Ann Hutchison
Ames Research Center, Mountain View, CA
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Jet Propulsion Laboratory, Pasadena, CA
(Phone: 818/354-5011)

For Release
December 14, 1995

NOTE TO EDITORS: N95-82

BRIEFING SET TO ANNOUNCE EARLY GALILEO PROBE RESULTS

Scientists analyzing data returned by NASA's Galileo atmospheric probe into Jupiter will unveil early scientific discoveries at a news briefing at 1 p.m. EST on Tuesday, Dec. 19, at NASA's Ames Research Center, Mountain View, CA.

Project scientists and principal investigators will present results from the probe's instruments based on data collected Dec. 7 during the probe's fiery 57-minute descent through the giant gas planet's upper atmosphere last week.

The Galileo orbiter spacecraft successfully entered orbit around Jupiter and is operating normally. It will orbit the planet for at least two years to enable scientific studies of Jupiter, its moons and the surrounding space environment.

The briefing will be carried live on NASA Television via Spacenet 2 Transponder 5, Channel 9, at 69 degrees West longitude. The frequency is at 3880.0 megahertz, audio at 6.8 megahertz.

The briefing will be postponed in the event of a government-wide furlough that extends into Tuesday.

-end-

Video Advisory

National Aeronautics and
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Washington, DC 20546
(202) 358-1600

For Release

David E. Steitz
Headquarters, Washington, DC
(Phone:. 202/358-1730)

December 14, 1995

VIDEO ADVISORY: V95-175

NEW AIR CLEANING DEVICE FEATURED ON NASA TV FRIDAY

Each year hundreds of people die due to carbon monoxide fumes from leaky furnaces. On Friday, NASA TV's video news file will feature pieces on a device invented at NASA's Langley Research Center, Hampton, VA, that uses a new class of low-temperature oxidation catalysts to convert carbon monoxide to non-toxic carbon dioxide at room temperatures. The device also can remove formaldehyde fumes.

Video news files air each day at noon, 3, 6 and 9 p.m. EST.

ITEM #1: BREATHING EASIER
New device converts deadly carbon monoxide to non-toxic carbon dioxide.

ITEM #2: INTERVIEW -- DAVID SCHRYER, RESEARCH SCIENTIST
Schryer explains the benefits of the carbon monoxide converter.

ITEM #3: STS-72 ANIMATION
Animation of upcoming Jan. 11 Shuttle mission objectives.

NASA Television is broadcast on Spacenet 2, transponder 5, channel 9, C-Band, located at 69 degrees West longitude, with horizontal polarization. Frequency will be on 3880.0 megahertz, with audio on 6.8 megahertz.

-end-

News Release

National Aeronautics and
Space Administration

Washington, DC 20546
(202) 358-1600

For Release

December 15, 1995

Jim Cast
Headquarters, Washington, DC
(Phone: 202/358-1779)

Dom Amatore
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-0031)

RELEASE: 95-219

X-33 DRAFT COOPERATIVE AGREEMENT NOTICED ISSUED

NASA has issued a draft Cooperative Agreement Notice for the design, fabrication and flight test of the X-33 advanced technology demonstrator -- the next step in development of a new generation of reusable launch vehicles that will dramatically reduce the cost of putting payloads into orbit.

"We are seeking comments on the draft notice by Jan. 22, 1996, from industry and any other interested parties," said X-33 project manager Gene Austin. "We will consider these comments before issuing the actual Cooperative Agreement Notice in April 1996."

The April notice will solicit proposals for a joint government and industry effort to demonstrate single-stage-to-orbit technologies by means of the X-33. Three aerospace companies -- Lockheed Martin Skunk Works, McDonnell Douglas Aerospace and Rockwell International Corp. -- have been working with NASA since March on concept definition and design of the X-33 in Phase I of the program. NASA will select an industry partner to work with in Phase II, in which the X-33 will demonstrate vehicle reusability and operability concepts that assure low cost operations and rapid processing for reflight. Phase II will culminate in flight testing of the X-33, beginning in early 1999.

"X-33 is an experimental program intended to determine if single-stage-to-orbit will work," Austin said. "It will give government and industry the means to decide by the end of this decade the feasibility of developing an operational next-generation reusable launch vehicle. That development, if it occurs, will be led by industry."

NASA and industry will share costs during Phase II of the X-33 program, with NASA budgeting a total of over $900 million in expenditures through 1999. The amount its industry partner will invest is to be determined.

-more-

Industry proposals will be due mid-May 1996, and NASA expects to select its industry partner by July, subject to approval from the White House to proceed into this next phase of the X-33 program.

The X-33 draft Cooperative Agreement Notice is available in the NASA Acquisition Internet Service at:

http://procure.msfc.nasa.gov.

-end-

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